Motorship

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Motorship

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Volume XII February, 1927 *Number 2*

Complete Success of the First Voyage of U. S. S. B. Motorship Tampa

At Full Power Across Atlantic with a Capacity Cargo and Back at Good Speed in Heavy Weather, Docking with Her Engine Ready for Sea Again

HAVING behaved perfectly throughout her maiden voyage of 8000 miles to Europe and back, with her main engine, auxiliary machinery and electrical gear all in first-class order, without a fault having developed anywhere in her new installation, the United States Shipping Board's converted motorship TAMPA docked at an American port again early last month.

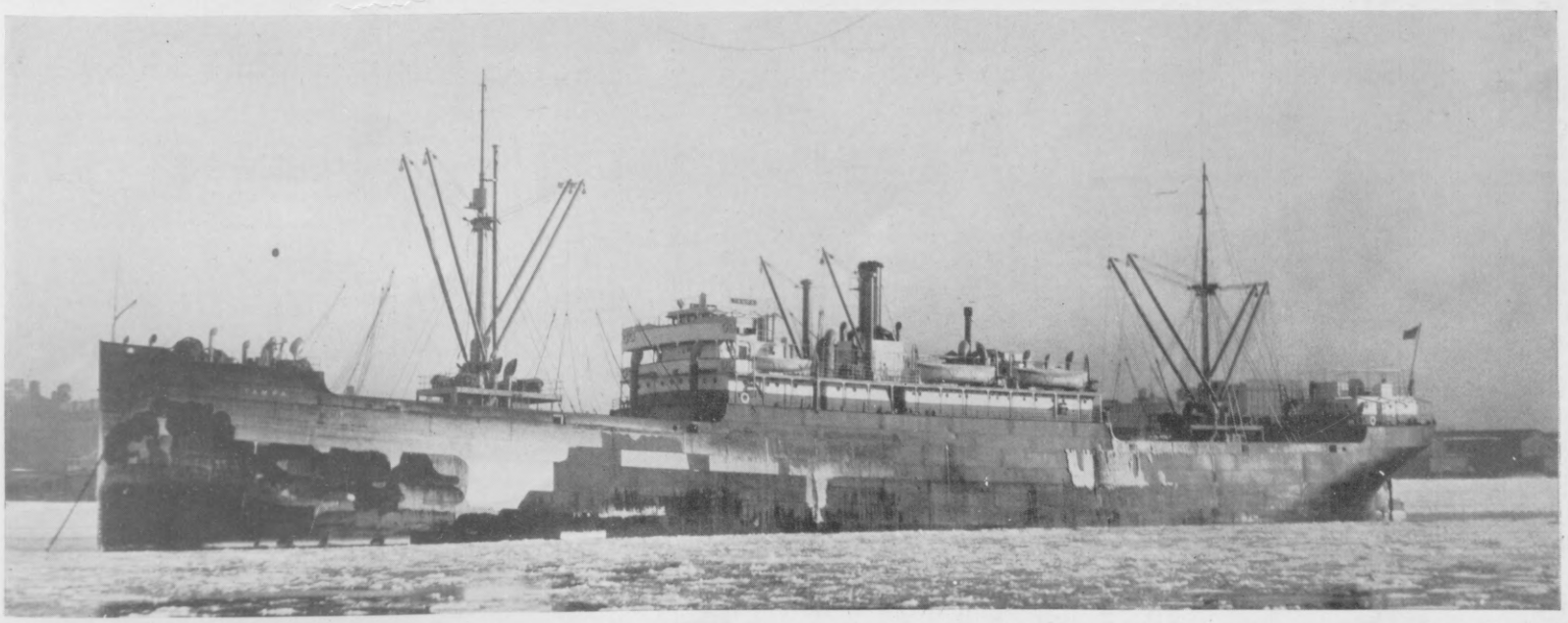
She had done what very few vessels of any sort ever have done: she had made the outward passage with the engine turning up to full revolutions practically all the way. Between the pilot stations at Savannah, Ga., and at Bremerhaven, Germany, a distance of 4100 miles, the average revolution were 94.2 per minute, only three-quarters of a revolution below full speed.

Engine indicator cards taken each day demonstrated that the propeller was absorbing more than the rated engine power for those revolutions. The cards showed an average of 3980 i.hp. during the 14½ days of the sea voyage to Germany, coinciding practically with the 2900 s.hp. for which the engine was designed, and yet with almost one revolution to the good.

Characteristics of Ms. Tampa

Gross register	5959 tons
Net register	3703 tons
Length overall	416 ft. 0 in.
Length b.p.	402 ft. 0 in.
Beam, molded	54 ft. 0 in.
Depth, molded to main deck	33 ft. 9 in.
Displacement load	13,010 tons
Mean draft at above	26 ft. 10¾ in.
Power—main engine	2900 s.hp.
Service speed (about)	11½ knots
Endurance	14,000 miles
Total deadweight capacity	9120 tons
Fuel oil, double bottom	760 tons
Lubricating oil	16 tons
Fresh water	164 tons
Cargo deadweight capacity (full endurance)	8180 tons
Cargo deadweight capacity (half endurance)	8660 tons

Of her arrival on the other side an excellent report was made in *The Engineer*, a professional magazine of worldwide reputation, published in London. That everything aboard was shipshape is well authenticated by the following extract from the article which appeared in that magazine: "The Worthington Pump & Machinery Corporation, having the fullest confidence in their Diesel oil engine, invited a very representative party of marine engineers, shipbuilders and others to make a visit to the vessel on her arrival, and this party, accompanied by Mr. C. P. Coleman, chairman of the Board of Directors, Worthington Pump & Machinery Corporation, and Mr. T. C. Pulman, managing director of Worthington-Simpson, Ltd., London, boarded the TAMPA at the mouth of the River Weser before her arrival at Bremerhaven, so taking every advantage of the opportunity offered not only to inspect the machinery in operation, but also during the maneuvering into port. Such a close inspection being made on the termination of a voyage of 4100 miles establishes, we believe, a record. On boarding the ship the visitors proceed-



U. S. S. B. Ms. Tampa, after completing a noteworthy maiden transatlantic voyage, is to be operated in the New York-S. America Trade

Maiden Voyage of U. S. S. B. Motorship Tampa—Savannah, Bremen, Rotterdam, Antwerp, Boston, New York, Nov. 22, 1926-Jan. 16, 1927

Summary of Passages, with Distances, Times at Sea, Average Speed and Fuel Consumption at Sea and in Port

PASSAGE	DISPLACEMENT MEAN	PORT TO PORT DISTANCE	PORT TO PORT TIME	FUEL CONSUMED TOTAL	FUEL CONSUMED 100 MILES	SEA PASSAGE DISTANCE	SEA PASSAGE TIME	SEA PASSAGE SPEED	IN PORT DAYS	IN PORT SHIP FUEL	IN PORT WINCH FUEL
Savannah, Ga., to Bremerhaven, Germany..	10,025 tons	4,182 miles	14d. 21h. 28m.	1,560 bbl.	37.3 bbl.	4,101 miles	14d. 11h. 31m.	11.8 knots	8d. 18h. 41m.	18 bbl.	28 bbl.
Bremerhaven to Rotterdam, Holland	light	———	1d. 07h. 01m.	97 bbl.	———	205 miles	0d. 23h. 51m.	8.4 knots	3d. 03h. 35m.	2 bbl.	14 bbl.
Rotterdam to Antwerp, Belgium	———	115 miles	0d. 13h. 24m.	50 bbl.	———	———	———	8.5 knots	3d. 22h. 49m.	8 bbl.	10 bbl.
Antwerp to Boston, Mass.	8,755 tons	3,269 miles	13d. 13h. 20m.	1,170 bbl.	35.8 bbl.	3,185 miles	13d. 02h. 14m.	10.1 knots	7d. 21h. 08m.	30 bbl.	23 bbl.
Boston to New York, N. Y.....	6,600 tons	298 miles	1d. 02h. 22m.	107 bbl.	36.0 bbl.	267 miles	0d. 22h. 55m.	11.6 knots	———	———	———

Principal Data from Engineer's Log—Savannah, Ga., Nov. 22, 1926 to Bremen, Germany, Dec. 7, 1926

Entries of Pressures and Temperatures are omitted, because they are a repetition of the figures recorded in the official 30 days' trial of the engine (see MOTORSHIP, Dec., 1926). The entries reproduced below bear directly on the performance of the main and auxiliary machinery in their relation to the ship performance

Date	REVOLUTIONS R.P.M.	REVOLUTIONS Total	DISTANCE ENGINE Miles	DISTANCE OBSERVATION Miles	SLIP Per Cent	DURATION OF DAY Hr. Min.	OBSERVED SPEED Knots	AUX. NO. 1 Hr.	AUX. NO. 2 Hr.	AUX. NO. 3 Hr.	AUX. LOAD Kw.-Hr.	DONKEY BOILER Hr.	REMARKS
Nov. 23	95.07	109,250	243	223	8	19.07	11.6	24	—	—	1741	24	Ran off official 12-hour loaded full-speed trial run, 4 a.m. to 4 p.m. Average revolutions per minute 95. Speed of ship, 12.23. Fuel consumption, 7 tons.
Nov. 24	95.4	134,520	299	315	—4	23.36	13.4	6	18	—	1632	4	Slight water leak into crankcase and oil leak through piston telescope tubes. Made temporary wipers to stop same. Overhauled third and fourth stage compressor valves in No. 1 auxiliary engine and tested. O.K.
Nov. 25	94.9	134,700	300	263	12	23.41	11.1	20	4	—	1681	—	Adjusted all engine lubricator drips, as per manufacturers' instructions. No. 3 top cylinder exhaust pyrometer rod out of order. Wiring O.K.; must be element.
Nov. 26	93.6	132,645	296	278	6	23.36	11.8	—	24	—	1705	—	Slight trace of lubricating oil in engine cooling tank. Decreased fuel to No. 1 top spray valve.
Nov. 27	94.8	134,575	299	258	13	23.40	10.9	—	24	—	1666	—	Changed all oil for winch gears to 600 W. Tried out rubber wipers to keep water out of oil and oil out of water.
Nov. 28	91.6	129,950	289	268	7	23.37	11.5	—	24	—	1620	—	Took off crankcase inspection doors, to look for leaks, etc. All O.K.
Nov. 29	90.7	128,640	286	271	5	23.38	11.4	—	24	—	1628	—	Reduced lift on No. 2 cylinder bottom back, spray valve.
Nov. 30	92.4	130,770	290	280	3	23.36	12.0	—	24	—	1627	—	Took off cofferdam plates to inspect for leaks from sump, F.W. and fuel tanks. O.K.
Dec. 1	94.1	133,100	295	283	4	23.33	12.1	—	24	—	1600	—	Lubricating oil centrifuge spindle broke and bent bowl; straightened out same in lathe and put centrifuge in working order
Dec. 2	94.4	133,610	297	283	4	23.36	12.0	24	—	—	1607	—	Increased lift of No. 2 cylinder bottom back spray valve. Made adjustments on Mianus engine and tried out same. Works O.K. on governor now.
Dec. 3	94.9	133,940	298	284	4	23.31	12.1	24	—	—	1634	6	No. 4 top cylinder electric pyrometer rod out of order. Getting considerable amount of water out of lubricating oil through centrifuging.
Dec. 4	94.7	133,730	297	268	9	23.32	11.4	24	—	—	1536	6	Increased amount of fuel to No. 2 bottom cylinder spray valves. Nos. 1 and 4 piston packing blowing slightly at short intervals, but stops when lubricating oil supply is increased slightly.
Dec. 5	95.3	134,270	301	276	8	23.30	11.7	24	—	—	1607	—	Stern gland packing leaking badly. Took up on same several times until there is no more to take up, and will have to add more packing in gland after making port and unloading. Increased lift on No. 2 bottom back spray valve.
Dec. 6	95.5	136,350	303	289	4	23.41	12.1	24	—	—	1636	—	Tried out scavenge valve clutch and air starting pilot valves. O.K.
Dec. 7	96.0	124,490	276	266	4	21.30	12.4	21.5	—	—	1498	1	Tried out main engine for reversing, etc., and all auxiliary engines, before making port. All O.K.

General Remarks on Weather, etc. Weather conditions for trip were very good. Engines ran remarkably well at all times and even when ship was pitching slightly

Principal Data from Engineer's Log—Antwerp, Belgium, Dec. 25, 1926 to Boston, Mass., Jan. 7, 1927

Entries of Pressures and Temperatures are omitted, because they are a repetition of the figures recorded in the official 30 days' trial of the engine (see MOTORSHIP, Dec., 1926). The entries reproduced below bear directly on the performance of the main and auxiliary machinery in their relation to the ship performance

Date	REVOLUTIONS R.P.M.	REVOLUTIONS Total	DISTANCE ENGINE Miles	DISTANCE OBSERVATION Miles	SLIP Per Cent	DURATION OF DAY Hr. Min.	OBSERVED SPEED Knots	AUX. NO. 1 Hr.	AUX. NO. 2 Hr.	AUX. NO. 3 Hr.	AUX. LOAD Kw.-Hr.	DONKEY BOILER Hr.	REMARKS
Dec. 25	91.0	5,945	14	15	—5	1.05	13.6	1	—	—	——	1	Rough, following sea
Dec. 26	91.8	134,965	302	304	0	24.31	12.4	24	—	—	1670	22	Rough, following sea
Dec. 27	91.7	134,640	302	291	3	24.32	11.9	24	—	—	1618	22	Moderate N.E. sea.
Dec. 28	91.0	133,340	300	299	0	24.30	12.2	24	—	—	1662	4	Smooth sea.
Dec. 29	90.2	131,810	297	297	0	24.28	12.1	24	—	—	1686	8	Smooth sea—variable winds.
Dec. 30	90.4	132,640	297	270	9	24.28	11.0	24	—	—	1651	4	Moderate sea—heavy ground swell.
Dec. 31	89.4	129,950	291	248	15	24.20	10.2	24	—	—	1616	—	Moderate S.E. gale. Rough beam sea. Ship pitching and engine racing slightly. Governor working O.K.
Jan. 1	80.5	117,260	262	197	24	24.18	8.1	—	24	—	1622	4	Moderate N.W. wind. Rough sea. Had to reduce speed as engine raced and governor tripped often.
Jan. 2	90.5	132,050	296	287	3	24.24	11.8	—	24	—	1629	10	Rough S.E. sea. Ship pitching and engine racing at times. Governor worked O.K.
Jan. 3	85.0	125,490	282	186	34	24.18	7.6	23	—	1	1614	13	Rough, irregular broken sea. Engine racing badly, but governor worked O.K.
Jan. 4	78.0	113,570	252	191	24	24.16	7.9	24	—	—	1572	24	Rough N.W. sea. Strong N.W. wind. Ship pitching badly and engine racing. Governor working O.K.
Jan. 5	90.5	132,670	297	280	5	24.26	11.5	24	—	—	1584	24	Rough sea. Fair winds. Engine running normally. Ship running steadily.
Jan. 6	82.5	120,300	267	179	33	24.14	7.3	24	—	—	1611	24	Rough sea and strong head winds. Had to slow down to keep engine from racing as ship pitched and rolled badly.
Jan. 7	82.0	96,670	205	141	30	20.19	7.0	20	5	—	1292	20	Rough seas and strong head winds. Ship pitched and rolled badly. Had to run on reduced speed to prevent engine racing

ed directly to the engine-room. Everything was found by the party in excellent condition, and the reports received were in every way satisfactory, as is proved by the inspection of the ship's log. . . . On the day following arrival in port the same party carried out a further inspection of the machinery when the vessel was in dock, the general opinion expressed being that the machinery installation was satisfactory in every way."

Maintained Speed of 11.8 Knots

A study of the log extracts (reproduced on page 100) demonstrates that the outward passage from Savannah, Ga., was a meritorious achievement for all concerned. The vessel was loaded to the hatches with cotton, but that, of course, did not sink her to her marks. The cargo deadweight was about 5240 tons, and the total deadweight with fuel and water about 6150 tons when she sailed. This gave her a displacement of 10,250 tons, reduced by consumption of fuel and water to 9800 tons on arrival at Bremerhaven, the mean displacement during the passage being thus 10,025 tons. In weather continuously favorable she averaged 11.8 knots on the sea passage. One may therefore accept her load displacement speed as 11½ knots.

After discharging her cotton in Bremerhaven, TAMPA loaded miscellaneous cargo at Rotterdam and Antwerp and sailed on her return passage with about 3850 tons in her holds and about 4850 tons total deadweight, including fuel, fresh water and ballast. Loaded down only to a mean displacement of 8755 tons she could not in the heavy seas of the winter North Atlantic keep her propeller immersed, and the log is full of entries of speed reduced to check the engine racing. The return passage was a trial of a different character, having been largely a test of engine governing. On this point Diesel engines are notably better performers than steamers, and it is generally held for this reason that motorships are faster than steamers in heavy weather.

In the log of the return passage from Antwerp to Boston the column of remarks is filled with weather reports, in contrast to the reports of inspections and minor adjustments that filled the corresponding column of the outward bound log. Through it all, TAMPA made very good speed, having averaged over 10 knots during the sea passage of 13 days. Due to the variations in engine power consequent upon the reduction of speed to check racing, the average of the daily indicator cards would be practically meaningless and is therefore not in this instance reported.

Fuel and Lub. Oil Consumption

Major data of the performance are presented in the tables on page 100. There were five passages in the first voyage, and very fortunately the first passage, on account of the uniformity of the conditions, serves unusually well to check the engine performance.

We have quoted the average power as 3980 i.hp., the duration of the sea passage was 347 hr. 24 min., and in that period the main engine consumed 1425 bbl. The fuel is classed as 30 deg.-32 deg. Beaumé. If we figure it therefore as 31 deg. and use the A. P. I. scale of equivalent weights, the consumption per i.hp.-hr. figures out as 0.314 lb. If this were reduced to the basis of 18,500 B.t.u. per lb. it would probably coincide with the average consumption measured on the 30 days' trial of the engine at the Worthington plant. Lubricating oil measurements on the outward passage were vitiated by a loss of oil, but on the homeward passage the consumption was recorded as about 18 gal. per 24 hr. for all purposes, which agrees closely with the official trials ashore. On the outward passage the daily fuel consumption from port to port for all purposes was about 14 tons. On the homeward passage the daily consumption was less on account of the reduced engine speed.

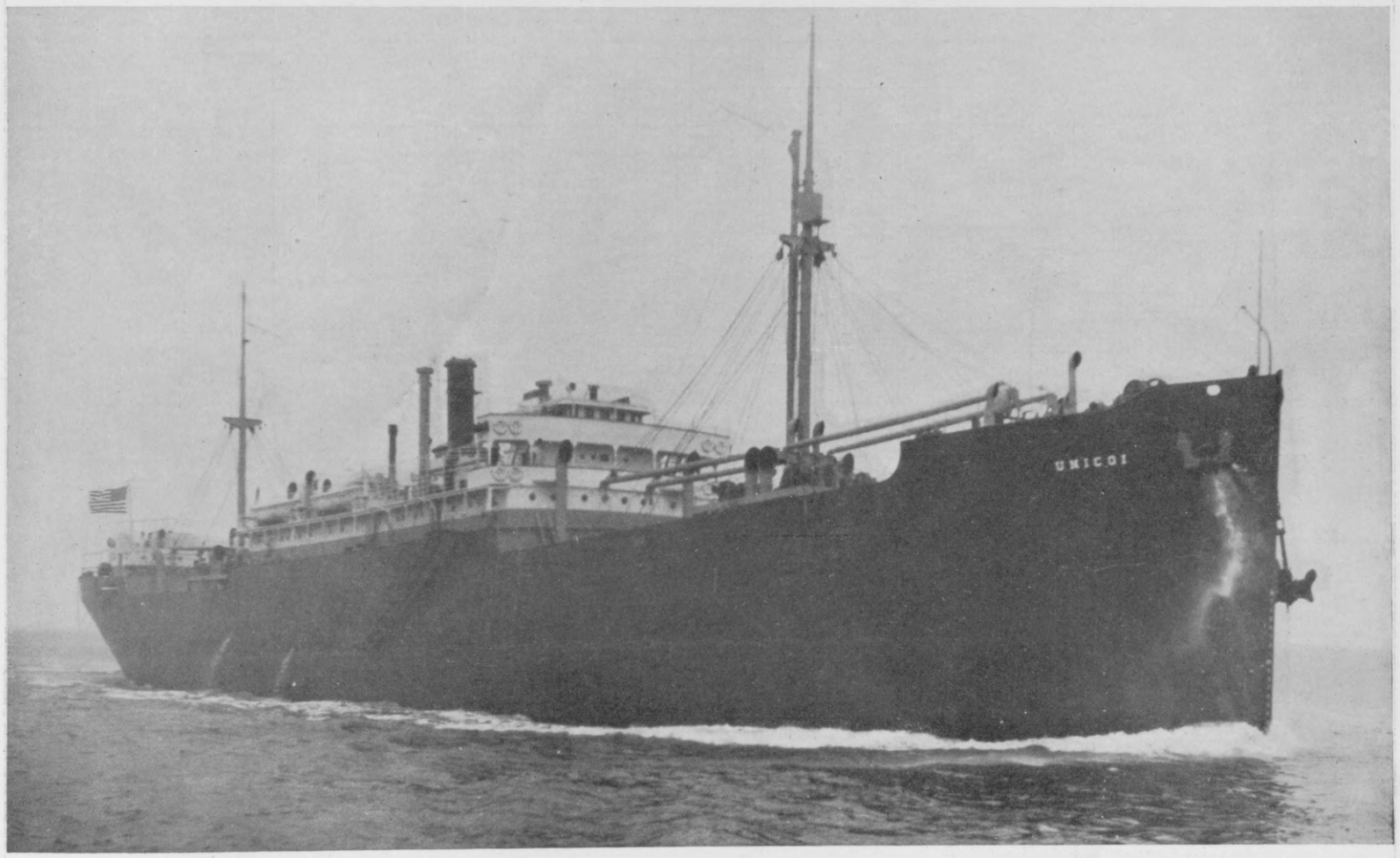
Port Consumption Figures

In port the ship spent during this voyage a total of nearly 24 days and registered during that period only 58 bbl. of fuel oil consumed for general ship service. This is less than 2½ bbl. of oil per day, an unusually low figure for port operation and remarkably economical in comparison with the port consumption of a steamer of similar size. For winch operation—discharging about 5240 tons at Bremerhaven, loading about 3850 tons at Rotterdam and Antwerp and then discharging about 2300 tons at Boston—a total of 75 bbl. of fuel was consumed, equivalent to about 0.9 ton fuel per 1000 tons of cargo handled into, or out of the ship.

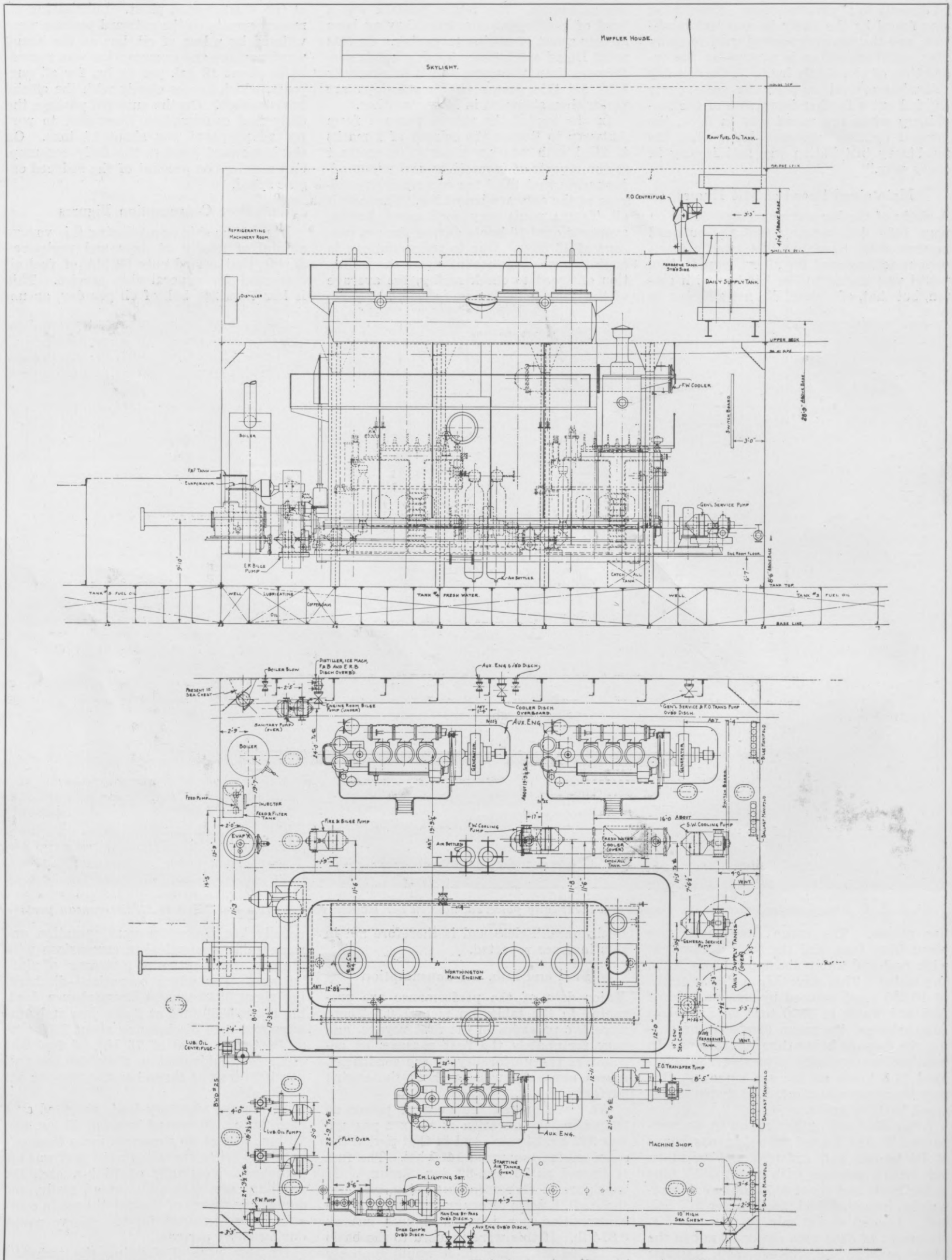
At sea the auxiliary load, averaged over each 24 hr., fluctuated between 65 kw. and 70 kw., and at no time was more than one auxiliary set in operation until port was approached. Nominally of 75 kw. each the auxiliary sets take an overload easily, and during the course of the day the set in operation is called upon for its reserve power during short periods.

On this general showing the technical staff of the Shipping Board is entitled to

(*Continued on page* 103)



U. S. S. B. Unicoi, sister vessel to the Tampa and identically powered, now on her maiden voyage from Galveston to Mediterranean ports



Engine room arrangement of ms. Tampa and her sister ms. Unicoi, showing disposition of auxiliary generators and pumps

World's Largest Yacht Diesel Propelled

Twin Bessemer Diesels of 1500 hp. Each, Highest Powered of Their Type Built, to Propel 294 ft. 16 Knot Motoryacht

MOTORYACHT construction for private ownership may be considered as having received a very definite impetus by the placing of a contract by Henry J. Gielow, Inc., with the Pusey & Jones Company, Wilmington, Del., for the construction of a motoryacht which, when completed, will be the largest ship of her kind in existence. Not only will she be the largest of her kind but also she will be one of the most completely fitted out. With her overall length of 294 ft., she will exceed in length by some 80 ft. a ship built in Great Britain last year, which was previously regarded as one of the largest motoryachts constructed. Bessemer Diesels have been selected to power the new vessel and these two units represent the highest powered individual engine of this make yet turned out. The engines will develop 1500 b.hp. each at 300 r.p.m. and will have eight cylinders, 18 in. diameter by 22 in. stroke. Bu-nite type pistons will be used and the engines will have hollow connecting rods. For the first time in Bessemer marine practice an *en bloc* system of construction has been used, and the engine frame work will be made up of two box castings.

Simplicity of control will be a great feature and the whole of the maneuvering is carried out by means of a single lever in an "H" frame at cylinder top level. It is worthy of note that the overall length of the engine—27 ft. 8¾ in.—is only 3 ft. 0 in. greater than that of the present 800 hp. engine although the power developed is practically double. The whole of the pumps for main engine operation are motor driven and operated separately from the main engine. They are fitted in duplicate. Electric power for driving the whole of the auxiliary machinery on the ship is supplied by two 100 kw. generators, each driven by a 6-cylinder 175 hp. Bessemer Diesel with cylinders 8½ in. diameter and 12 in. stroke.

Characteristics of New Motoryacht

Length overall	294 ft. 0 in.
Length on waterline	280 ft. 0 in.
Beam, molded	38 ft. 3 in.
Depth, molded	16 ft. 0 in.
Displacement	2300 tons
Total power	3000 hp.
Speed	16 knots
Speed of engines	300 r.p.m.

The ship itself will have a straight stem and a single knuckle counter stern. She is a flush decker with raised bulwark forward. A long deckhouse extends about two-thirds of the length of the main deck and contains the owners' private sitting room, sun room, and gymnasium. Here is also an observation room. There will be in all seven double berth staterooms for guests with seven bath rooms and four staterooms and two bath rooms for valets and maids.

Exhausts from the main and auxiliary Diesels are lead up into an oval stack amidships which will be fitted with a Sperry 10 in. visible air whistle showing a light for the duration of the whistle blast.

The chart and pilot house is on the main deckhouse top abaft the foremast. At the extreme forward end of the deckhouse is an 18 in. Sperry searchlight of high intensity 30,000,000 beam c.p. pedestal type. There will also be two 12 in. pedestal type units. The new ship is to have an exceptionally complete and up to the minute electro-navigational equipment and this comprises a Sperry gyro-stabilizer and a Sperry Gyro-Compass equipment of auxiliary battery type comprising a master gyro-compass, a steering repeater mounted on top of the gyro-pilot stand, and the bearing repeaters. An R.C.A. radio direction finder will also be fitted and arranged to operate with the gyro-compass equipment so that radio bearings can be read directly on the gyro-compass repeater card.

Other important equipment includes a Type D Sperry rudder indicator showing every degree up to 10 deg. and every 5 deg. from there to hard over. There is also an engine speed direct indicator showing revolutions ahead and astern.

Choice of airless injection engines for this powerful high speed machinery is indicative of the growing favor being accorded to this modern development of fuel injection. The Gielow-designed and Bessemer-engined yachts SUMAR, VIDOR, and ATHERO II have 800 hp. engines of this type and Henry Ford's yacht SIALIA has airless injection engines of 1300 hp. of another make. The step to 1500 hp. per engine is a big one.

This new vessel is the tenth and largest motor yacht designed by Henry J. Gielow, Inc., since 1920.

Complete Success of Ms. Tampa's First Voyage

(*Continued from page* 101)

great credit. The conversion of the ship has worked out as planned. TAMPA has become a first class freighter; she has the speed of the general cargo vessels built nowadays abroad (which must not be confused with express freighters); and every one of the many special features of her equipment has proved itself right in service. That the Newport News S. B. & D. D. Co. made a thorough job of the installation of machinery and of the reconditioning of the ship is evidenced by the satisfaction that has been obtained in the operation of the vessel. No better performance could be demanded of machinery than the Worthington double-acting engine of 2900 s.hp. yielded the first time it was called upon in the TAMPA, where it gave unequivocally good service. The accomplishment is a great credit to O. E. Jorgensen, its designer, and to the Worthington Pump & Machinery Corporation, its builders, who have given of their best to its development.

The greatest importance of the TAMPA'S success is that the United States possesses in her one of perhaps half a dozen vessels in the whole world equipped with what is considered to be the most advanced type of Diesel engine for large ships, namely, the 2-cycle double-acting engine, and the experience of the Shipping Board with her is available for all shipowners whether in foreign, coastwise or Great Lakes trade.

L. H. Hirschy, Chief Engineer

TAMPA has been well served by her engineers. L. H. Hirschy, the chief engineer, brought the ship back without a single repair needed. For 11 years he was in the Navy, five years of which were with the submarines, and he retired with the grade of lieutenant. For the last three years prior to his assignment as assistant inspector for the building of TAMPA'S main engine he was chief engineer of the S.S. ROBIN GOODFELLOW, owned by the Sea Shipping Co., a subsidiary of the U. S. Steel Corporation. While waiting to go to Buffalo for the building of the engine he filled in three months on the Diesel-electric lake and canal carrier TWIN CITIES. He watched the TAMPA'S engine built and tested, saw the auxiliary engines through the Blake & Knowles Works of the Worthington Corporation and attended the installation of the machinery in the vessel at Newport News. On the TAMPA his assistants have been W. C. Dowe, C. H. Coburne, A. F. Jones and J. W. Christiansen, as first, second, third and fourth, with C. J. Ruzika as electrician. The performance of the machinery and the excellent condition of the engine room at the end of the voyage testify to their ability.

Operating Advantages of U. S. S. B. Motorships

Ms. West Cusseta and Ms. West Honaker Allocated by the Shipping Board to Roosevelt Lines' Australian Service

By Kermit Roosevelt*

SHIPPERS interested in the trade between New York and Australian ports will now have a practical demonstration of the efficiency of Diesel propelled craft for freight carrying on such service. This was made possible by the sailing from Brooklyn on January 25, of the converted Shipping Board freighter WEST CUSSETA with a full cargo for Sydney, Melbourne and Adelaide. Ms. WEST CUSSETA, which together with her sister ship WEST HONAKER, has been allocated to our line by the Shipping Board, is powered by a McMike. The cold storage facilities will enable the ships to carry supplies for a round-the-world voyage.

Ms. WEST CUSSETA and her sistership Ms. WEST HONAKER are thoroughly modern in every respect, and offer just the up-to-minute service the modern shipper requires. They have a cruising radius of more than 17,000 miles and this means it will be possible to bunker them in New York for the round trip to Australia, giving full allowance for fuel expended in port and on the Australian coast. We attach a great deal of importance to this fact as it gives us a much lower voyage cost than with steamers.

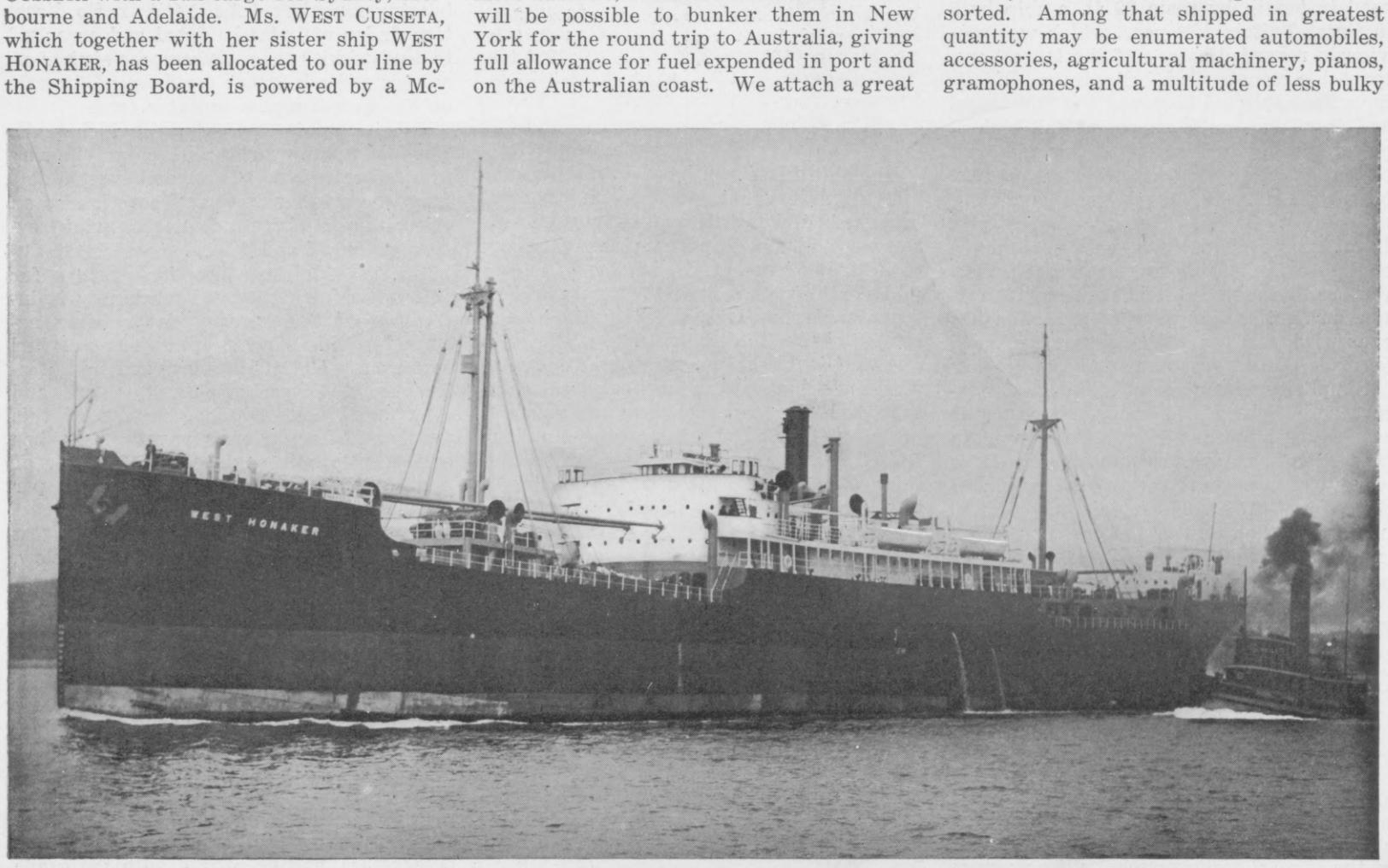
It can readily be understood how great an economy can be brought about in operating expenses with ships of this type, due to the vast saving in fuel costs, to the greater operating efficiency, and to the decrease in the personnel requisite in the engineroom.

The route these vessels will take is by way of the Panama Canal. They will have a sustained sea speed of 12 knots. They have excellent accommodation for 14 passengers. The staterooms are both double and single, and they are equipped with all the comforts and conveniences to be found on any modern transatlantic liner.

The vessels which the Roosevelt Company is at present operating in the Australian service are all of them coal burners. As such, they offer many difficulties, for there are only certain ports at which bunkers can be obtained at any except exorbitant rates.

The Australian trade is peculiar in that the volume of the cargo from the United State to Australian ports is greatly in excess of that exported by Australia to this country. The outward cargo is well assorted. Among that shipped in greatest quantity may be enumerated automobiles, accessories, agricultural machinery, pianos, gramophones, and a multitude of less bulky goods. On the other hand, the greater part of our imports from Australia consists of wool. This wool is a seasonal movement, so that it is only possible to obtain return cargoes for approximately 6 months.

It so happens that the Indian service, which the Roosevelt Steamship Company operate for the Shipping Board, dovetails most excellently with the Australian service, for the exchange of commodities between the United States and India are in inverse ratio to that between Australia and the United States. In other words, we import far more from India than we export to her. When the Australian wool season has drawn to a close, our vessels, after discharging their cargo in Australian ports, instead of returning to the United States in ballast will proceed to India and there load for this country, returning via the Suez Canal.

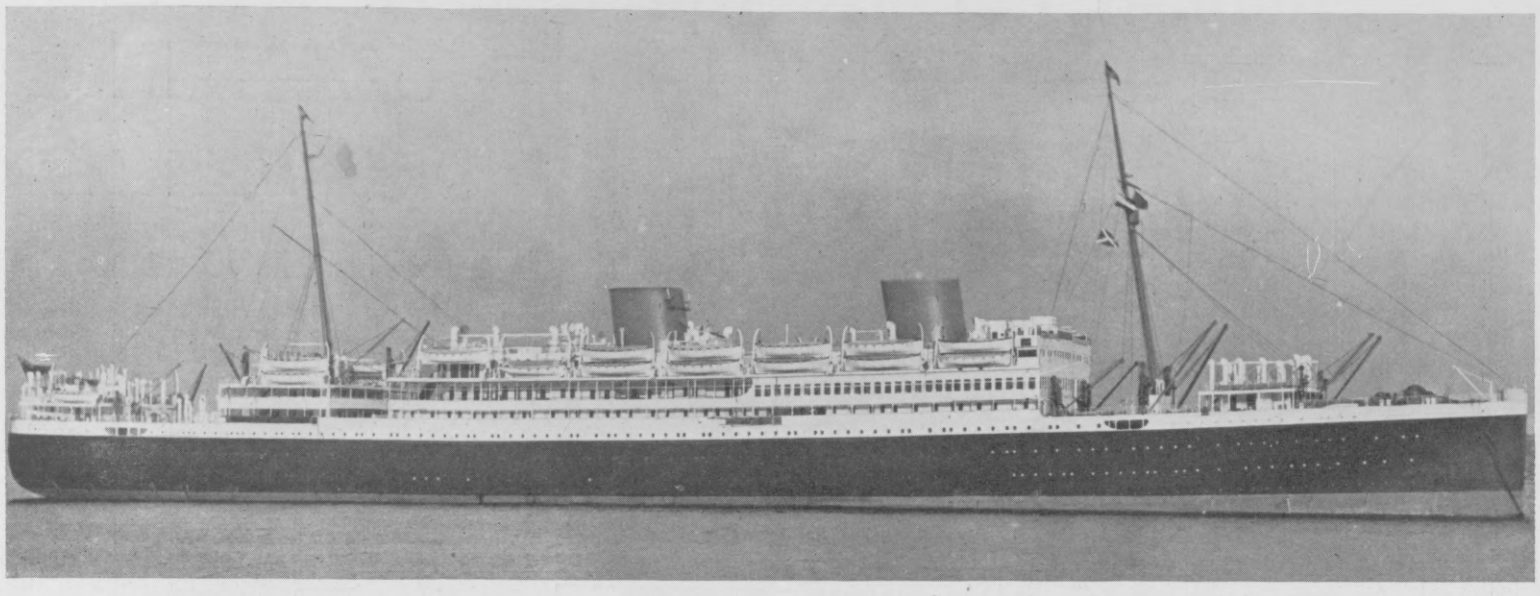


Ms. West Honaker and her sister, ms. West Cusseta, are now operating in Roosevelt Lines' New York-Australian service

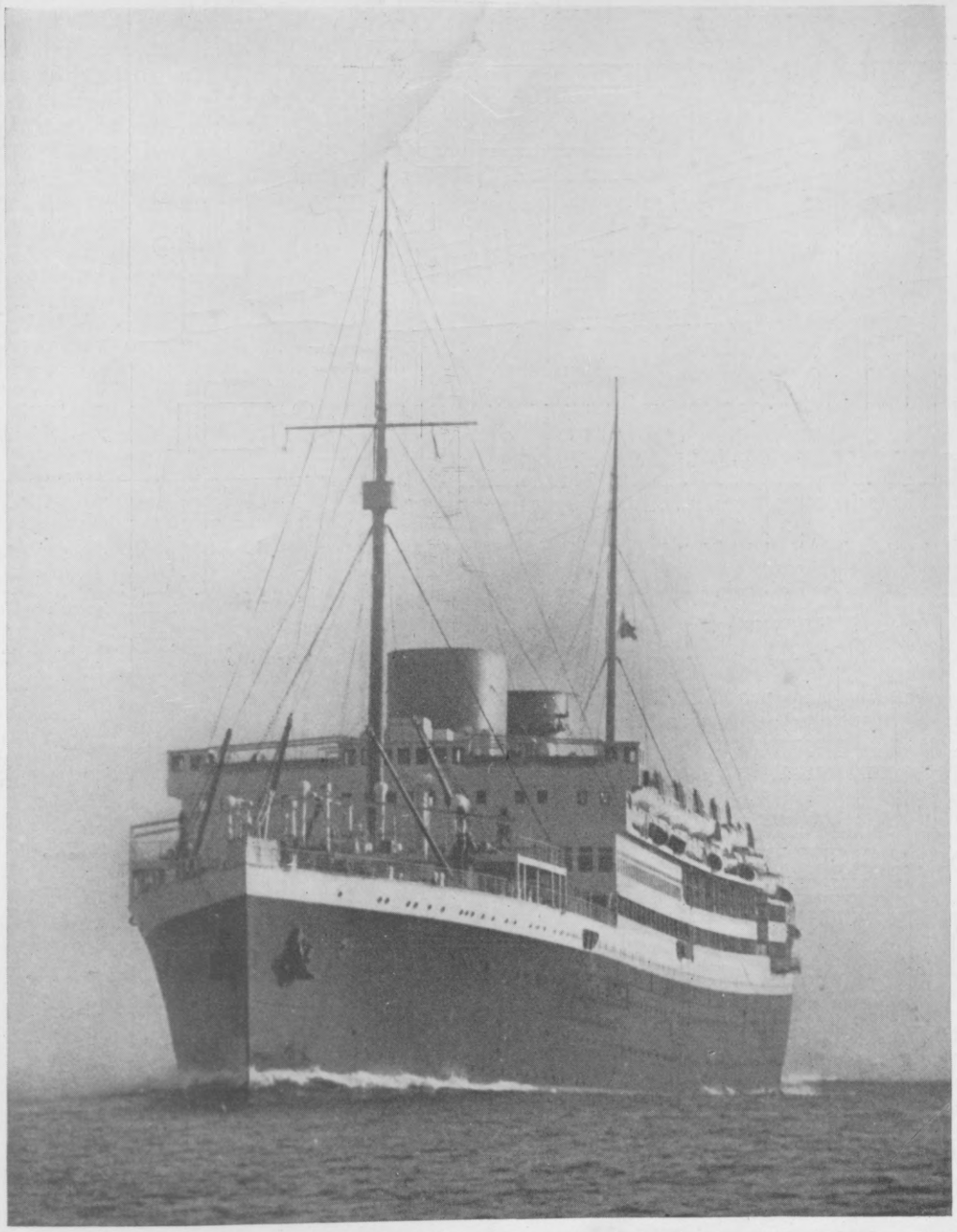
Intosh and Seymour single acting Diesel developing 2700 b.hp. at 95 r.p.m. The engine has an approximate fuel consumption of 12 tons a day, which contrasts favorably with the fuel consumption of a steamer of this size. The steamer would "eat up" about 32 tons of coal or 28 tons of oil per day on this service.

All auxiliary machinery on our new ships is electrically driven, and it is of most modern type. The cargo winches are electrically driven and facilitate rapid handling of cargo. One small boiler is fitted, which supplies steam for heating—the only steam used on the ship. A most modern fire extinguishing equipment is fitted, the Lux CO_2 system being used throughout the entire vessel. The steering gear is entirely electric and is of Sperry type with an automatic steerer, the well-known Metal

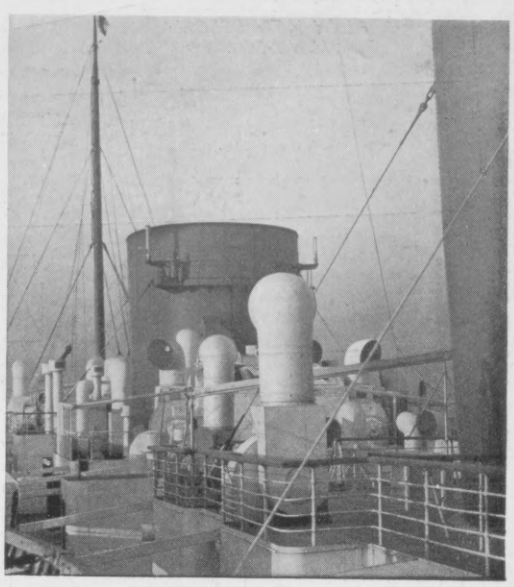
*President, Roosevelt Steamship Co., Inc.



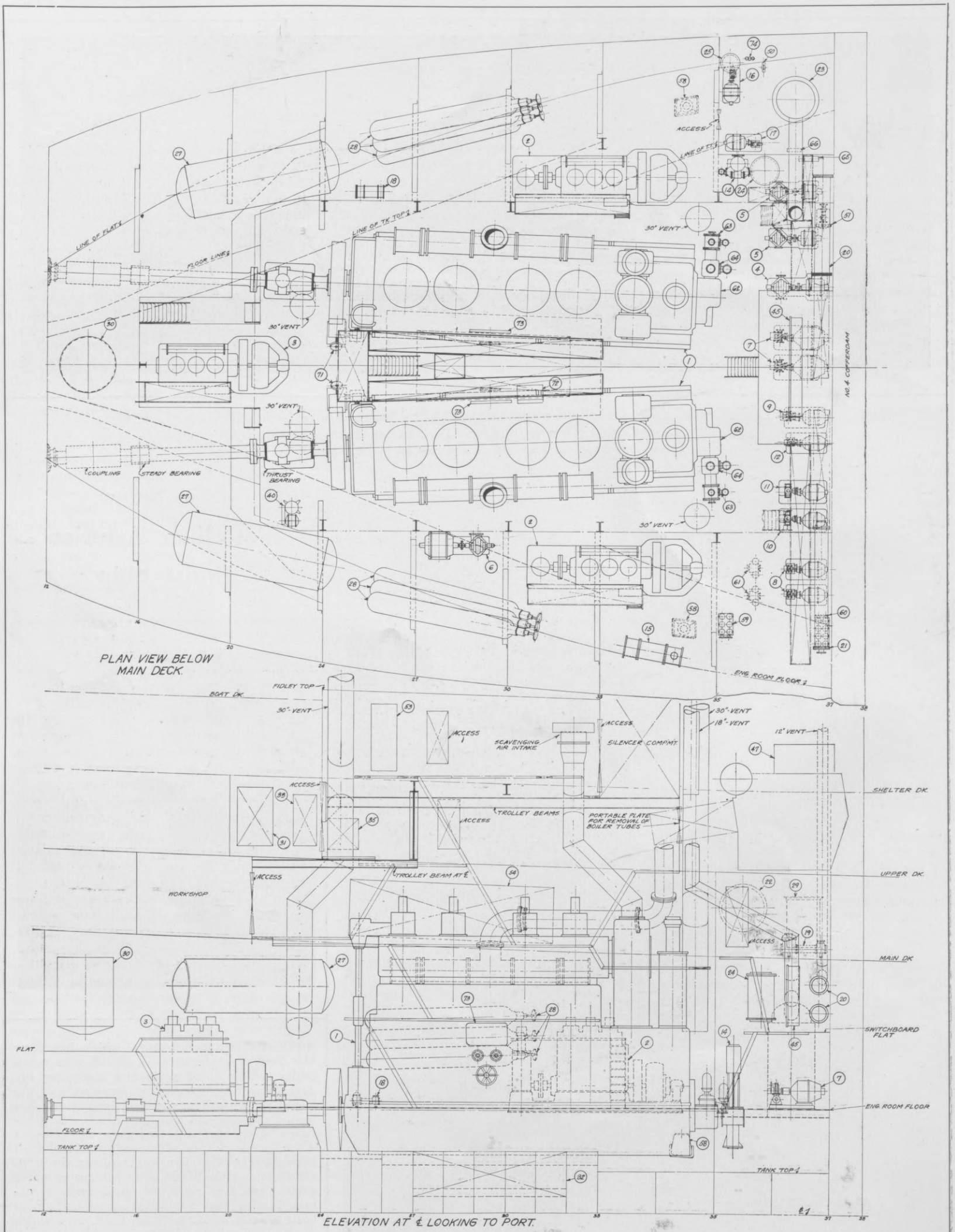
Top.—The 22,500 ton motorliner Asturias has an overall length of 655 ft. 8 in., and her profile is well balanced and distinctive
Bottom left.—The big ship outward bound from New York on her 22,000 mile Round-Africa cruise
Bottom right.—"Cruiser pattern" stacks are one of the distinguishing features



Twin Screw Motorliner Asturias Cruise Ship



MOTORLINER ASTURIAS, which left New York last month on a 22,428 mile ocean cruise taking in 20 ports and occupying 101 days, represents the highest expression of the Diesel engine builder's art yet in service. She is just one year old and her normal run is between Southampton, England, and Buenos Aires, in the express service of the Royal Mail Steam Packet Co. She ranks among the largest vessels of the world, either steam or motor driven, and her sea speed of 16 knots is obtained with two 8-cylinder double-acting 4-cycle Diesels of H. & W.-B. & W. type which develop collectively 15,000 s.hp. She is a product of Harland & Wolff, Ltd., Belfast.



Plan and elevation showing arrangement of main and auxiliary Diesel machinery as installed on Standard Oil Co.'s tanker Ms. E. T. Bedford

The Standard Oil Tanker E. T. Bedford

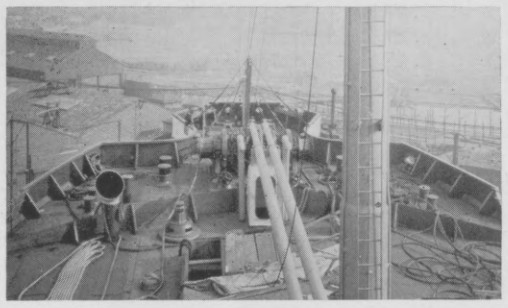
Dieselization Has Made This Ship One of the Largest and Most Efficient Bulk Oil Freighters Flying the American Flag

DIESELIZATION of the Standard Oil Co.'s large tanker E. T. BEDFORD, to which we made brief reference in our January issue, has added an important and economical unit to the already large, up-to-date motorship fleet operated by this company and its subsidiaries. Twin Busch-Sulzer Diesels of 3000 b.hp. now form the main propelling plant, and the auxiliary machinery and other equipment of the ship have been brought thoroughly into line with the high standard exemplified by the main machinery. This ship is an addition to the seven existing tankers fitted with engines of Sulzer type aggregating 18750 b.hp. owned by foreign subsidiaries of the Standard Oil Co. The principal auxiliaries are electrically driven, steam being used only for cargo handling, for tank heating purposes and for certain standby duties when the ship is in port. This steam plant with its necessary accessories naturally occupies extra space over and above that which would be required if the ship used electric auxiliaries only, but such an addition is practically a necessity in a bulk oil freighter. A fine job has been done in converting the ship and she is a credit both to the Federal Sb. Co., Kearny, N. J., who carried out the work, and to the Standard Oil Co., the owners.

Characteristics of Ms. E. T. Bedford

Length b.p.	499.2 ft.
Beam, molded	68.1 ft.
Depth, molded	30.5 ft.
Gross tonnage	9563 tons
Net tonnage	5978 tons
Power	3000 b.hp.
Speed	90 r.p.m.
Number of main engines	2

Ms. E. T. BEDFORD was constructed at Kearny, N. J., in 1921. She is an oil tanker built on the longitudinal system of framing and is of shelter deck type. The conversion work was confined almost entirely to the aft end of the ship and consisted in the removal of the whole of the original triple expansion machinery with attached turning and reversing engines, horse shoe type thrust blocks, thrust shafts and intermediate shafts, etc., together with condenser pumps and other auxiliaries. The engine seatings, supports, ladders, gratings, trolley beams, ventilators, piping, telegraphs were also torn out. In fitting the new Diesels, as much of the existing machinery as could be conveniently adapted was refitted, and



Anchor beds forward

this list is somewhat larger than would be the case with an ordinary freight ship conversion because of the inevitable use of steam for tank heating purposes. This includes the stack itself, one feed water pump, two feed water injectors, one condensate pump, a feed water filter and a steam driven generator.

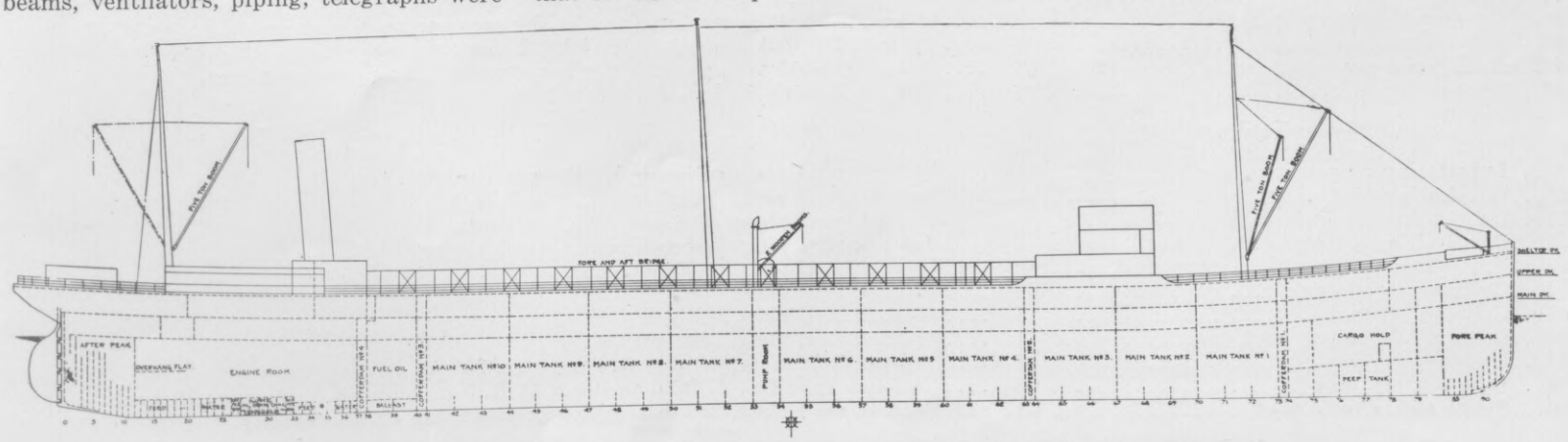
Certain structural removals were necessary in order to permit of the shipping of the new machinery with its auxiliaries, and certain structural alterations had to be carried out in view of the different character of the Diesel machinery compared with that of the steam plant.

Looking aft from bridge

Removals of structure included the elimination of the entire divisional screen bulkhead below the upper deck, separating engines and boilers, the divisional bulkhead in the engine and boiler casing between the upper deck and the casing top, the forward end and part of the top of the boiler casing. The upper deck between frames 35 and 37 with the exception of a part of the stringer plates as required for deck continuity was lifted off. The donkey boiler flat, cofferdam bulkhead No. 37 between upper and shelter decks, for a breadth extending each side of the center line to the engine casing, were removed, together with the center line division bulkhead attached.

New construction involved principally the construction of new support girders for the Diesels, rearrangement of a portion of the double bottom structure, and the building of a new auxiliary boiler enclosure on a flat at the forward end of the machinery space.

The original inner bottom plating aft of frame No. 33 for the necessary breadth and distance aft required by the new foundations was removed and floors and girders within this area cut down to the level of the inner bottom existing forward of frame No. 33. The design for the new foundation was arranged to interfere as little as possible with the existing transverse connection to the inner bottom. Within the double bottom compartment, in way of each web of the main engine girders there is now installed for the entire length of the girders (when the web is not directly over a present intercostal girder) an intercostal girder of similar scantling and form as the existing ones. New inner bottom tank top plating is installed. Connections to the old structure and the degree of tightness are made to conform to the requirements of Lloyds Register of Shipping and the American Bureau of Shipping. Between existing pillars at frame No. 30 there are suitable girders to compensate for the loss of pillaring removed with strong beam at frame No. 33. The inner bottom, tank top, and other structure where foundations and seating connections have been removed, leaving useless rivet holes, have the holes filled in by electric welding or riveted up through facing and/or backing flat bar strips, and



Inboard profile of the converted motortanker E. T. Bedford

Standard Oil Motortanker E. T. Bedford, Converted by Federal Sb. Co., Kearny, N. J., Engined by Busch-Sulzer Bros., St. Louis, Mo.

Item	Name of Unit	No. of Units	Description and Characteristics
	Propelling Machinery		
1	Main engine	2	Busch-Sulzer 1500 b.hp., 2-cycle, single acting, 4 cylinders 30 in. x 42 in., 95 r.p.m.
2	Propeller	2	Federal-Akimoff, manganese bronze, 4-bladed, built up, 15 ft. 0 in. diameter.
3	Line shaft	2	Federal, solid forged steel, 15 in. diameter.
4	Propeller shaft	2	Federal, solid forged steel, 14½ in. diameter.
5	Thrust shaft	2	Busch-Sulzer, single collar forged steel, 14⅜ in. diameter.
	Boilers and Heaters		
6	Donkey boiler	2	Water-tube, 250 lb. working pressure, 1591 sq. ft. heating surface.
7	Heating boiler	1	Federal, vertical, 100 lb. working pressure, 269 sq. ft. heating surface.
8	Feed water heater	1	136.4 sq. ft. heating surface, originally in ship.
9	Fuel oil heating boiler	1	Bethlehem, coil, 44.8 sq. ft. heating surface, originally in ship.
	Condensers and Coolers		
10	Condenser	1	Federal, steel plate type, 2000 sq. ft. cooling surface, 15 in. vacuum at 85 deg. Fahr. water, original condenser modified.
11	Lubricating oil cooler	2	Straight tube, multiwhirl 2-pass, 75 gal. per min. each.
12	Drinking water set	1	Davis Engineering Co., 350 gal. per day.
13	Fresh water cooler	2	Straight tube, multiwhirl, single-pass, 65 gal. per min. each.
	Compressors		
14	Main air compressor	2	3-stage attached to main engines, 825 cu. ft. free air per min. capacity, 1000 lb. per sq. in. pressure.
15	Auxiliary compressor	2	New London, attached to Diesel generator set by magnetic clutch, 150 cu. ft. free air per min., 260 r.p.m., 1000 lb. per sq. in.
16	Scavenge pump	2	Attached, approx. 2 lb. per sq. in. working pressure.
17	Emergency air compressor	1	2-stage motor driven, 1000 lb. per sq. in., 8 cu. ft. free air per min.
	Pumps		
18	F. o. injection pumps	2	Busch-Sulzer, attached to main engines.
19	Lubricating oil pump	2	Busch-Sulzer, attached to main engines, 50 gal. per min.
20	F. w. cooling pump	2	Busch-Sulzer, attached to main engines, 70 gal. per min. at 30 lb. per sq. in.
21	S. w. cooling pump	2	Busch-Sulzer, attached to main engines, 400 gal. per min. at 30 lb. per sq. in.
22	S. w. circ. pump	2	Worthington, centrifugal, motor driven, 500 gal. per min. at 30 lb. per sq. in., 15 hp. motor drive.
23	Fire and g. s. pump	1	Worthington, centrifugal 3-stage, motor driven, 200 gal. per min. at 125 lb. per sq. in., 40 hp. motor.
24	Condenser circ. pump	1	Worthington, centrifugal, motor driven, 1000 gal. per min. at 30 ft. head, 15 hp. motor.
25	Bilge pump	2	Northern rotary, motor driven, 275 gal. per min. at 25 lb. per sq. in., 8½ hp. motor.
26	F. o. transfer pump (Diesel)	2	Northern rotary, motor driven, 50 gal. per min. at 100 lb. per sq. in., 8½ hp. motor.
27	Lubricating oil pump	1	Northern rotary, motor driven, 125 gal. per min, at 30 lb. per sq. in., 8½ hp. motor.
28	Donkey boiler feed pump	2	Northern rotary, motor driven, 100 gal. per min. at 230 lb. per sq. in., 25 hp. motor.
29	Donkey boiler f. o. pump	1	Northern rotary, motor driven, 50 gal. per min. at 100 lb. per sq. in., 8½ hp. motor.
30	Heating boiler f. o. pump	1	Northern rotary, motor driven, 25 gal. per min. at 100 lb. per sq. in., 5 hp. motor.
31	Heating boiler feed pump	1	Northern rotary, motor driven, 30 gal. per min. at 125 lb. per sq. in., 5 hp. motor.
32	Donkey boiler reserve feed pump	1	Worthington, vertical simplex, 12 in. x 8 in. x 24 in., originally in ship.
33	Donkey boiler f. o. reserve pump	1	National Transit.
34	F. o. transfer pump	1	Worthington, horizontal duplex, 8 in. x 5 in. x 12 in., 125 gal, per min. at 250 lb. per sq. in., originally in ship.
35	Condensate pump	1	C. H. Wheeler, horizontal duplex, 6 in. x 7½ in. x 6 in., originally in ship.
36	Cargo oil pump	2	National Transit, 14 in. x 20 in. x 16½ in. x 24 in., 3000 bbl. per hr. at 250 lb. per sq. in., originally in ship.
37	Drainage pump	1	National Transit, vertical duplex, 314 gal. per min at 3000 lb. per sq. in., originally in ship.
38	Drainage pump forward	1	Worthington, horizontal duplex, 8 in. x 8 in. x 12 in., 354 gal. per min. at 75 lb. per sq. in., originally in ship.
40	Hand fire pump	1	Rumsey, double acting, 6 in. x 5½ in., 50 gal. per min., originally in ship.
41	Hand drain pump ('tween decks)	1	Rumsey, double acting, 5 in. x 5½ in., 30 gal. per min., originally in ship.
42	Lubricating oil sampling pump	1	Rumsey, hand operated plunger, 2 in. diameter 9 in. stroke.
43	Air pump	2	C. H. Wheeler, radojet, 3½ in. suction, 3 in. discharge, 15 in. vacuum at 85 deg. Fahr., originally in ship.
44	Fresh water pump	1	Horizontal duplex, 4½ in. x 2¾ in. x 4 in.
	Electrical Equipment		
45	Generator-compressor set	2	50 kw., 220 volt generator, 150 b.hp. Nelseco engine.
46	Generator set	1	100 kw., 220 volt generator, 150 b.hp. Nelseco engine.
47	Emergency generator set	1	20 kw., 110-115 volt, General Electric generator, steam prime mover.
48	Dynamotor	1	General Electric 15 kw., 220-110 volt.
	Tanks		
49	Lubricating oil settling tank	1	Federal, steel plate cylindrical, 1250 gal. capacity.
50	Lubricating oil storage tank	2	Federal, steel plate cylindrical, 1200 gal. each.
51	Lubricating oil drain tank	2	Federal, steel plate, 1000 gal. each, built into ship.
52	Diesel oil watch tank	2	Federal, steel plate, 900 gal. each.
53	Fuel oil day tank	2	Federal, steel plate, 2700 gal. each.
54	Compressor oil tank	1	Federal, steel plate, 400 gal.
55	Cylinder oil tank	1	Federal, steel plate, 400 gal.
56	Reserve circ. water tank	1	Federal, steel plate, 1500 gal.
57	Maneuvering air tank	2	Federal, 5 ft. diameter x 16 ft. 0 in. long, 253 cu. ft. capacity.
58	Injection air tank	6	National Tube Co., 22 in. diameter x 15 ft. 0 in. long, 32 cu. ft. capacity each.
59	Surge and whistle tank	1	Federal, steel plate, 250 lb. working pressure, 3½ cu. ft. capacity.

Standard Oil Motortanker E. T. Bedford, Converted by Federal Sb. Co., Kearny, N. J., Engined by Busch-Sulzer Bros. *(Continued)*

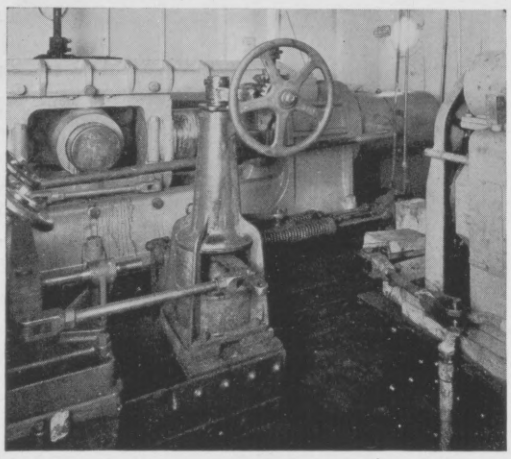
Item	Name of Unit	No. of Units	Description and Characteristics
	Miscellaneous		
60	Steering engine	1	Hyde, hydro-electric, connected with Sperry two-unit gyro pilot equipment.
61	Gyro equipment	1	Sperry two-unit outfit with connection to steering engine.
62	Ice machine	1	Brunswick, ammonia type, motor driven, 2 tons per day.
63	Radio compass	1	In chart room.
64	Main engine silencer	2	Maxim, steel plate, 22 in. diameter.
65	Generator-compressor engine silencer	2	Maxim, steel plate, 8 in. diameter.
66	Generator engine silencer	1	Maxim, steel plate, 8 in.
67	Fire extinguishing system	—	Lux, CO_2.
68	Main engine lubricators	—	Manzell.
69	Signal whistle	1	Tyfon, compressed air, 8 in. diameter, 250 lb. working pressure.
70	Fuel oil purifier	2	De Laval, centrifugal, motor driven.
71	Lubricating oil purifier	1	De Laval, centrifugal, motor driven.
72	Circ. water strainer	1	Andale, 6 in., duplex, 1000 gal. per min.
73	Donkey boiler f. o. suction strainer	1	Andale, 2 in., duplex.
74	F. o. discharge to watch tanks	1	Andale, 2 in., duplex, 50 gal. per min.
75	Piston cooling f. w. strainer	1	Andale, 3 in., duplex, 70 gal. per min.

the spaces have been made watertight.

The boiler equipment of the vessel at present consists of two Babcock-Wilcox water-tube boilers of 1591 sq. ft. heating surface each, and an auxiliary heating boiler accommodated in a steel air-tight enclosure with a gas tight door which extends from the inner bottom to the underside of the main deck. In the casing, on the after side of the after bulkhead of the donkey boiler enclosure, a steel gas tight compartment has been constructed to house the main and auxiliary mufflers as well as the stack from heating the boiler.

On either side of the center keelson in the double bottom, accommodation is provided for 1000 gal. of lubricating oil in drain tanks separated by cofferdams from boiler feed and circulating water tanks outboard of them.

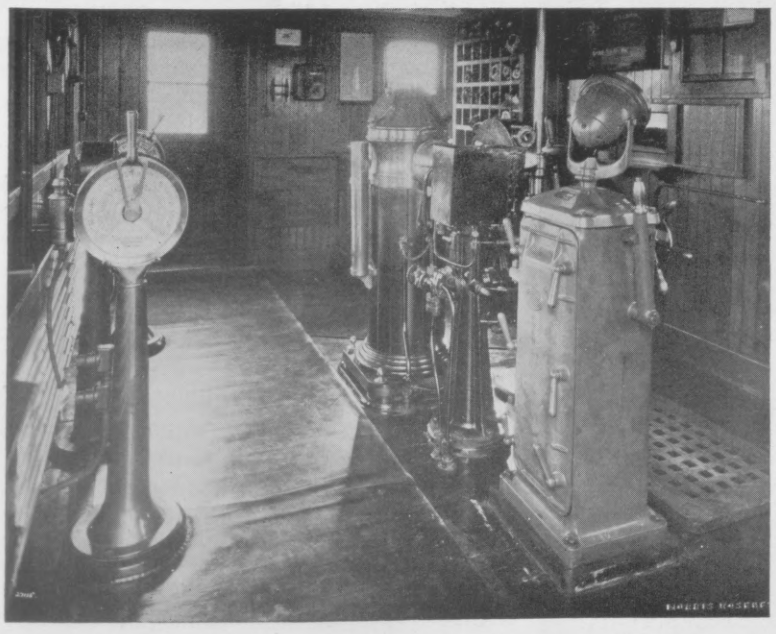
The main engine foundations comprise two longitudinal semi-box girders, one at each side of the bed plate, extending from frame No. 36 to two floor spaces abaft the aftermost bolted connection of the thrust block. Each semi-box girder consists of two vertical continuous web plates 5/8 in. thickness and about 15 in. apart. The inner girder of the outer pair is arranged to take the ending of the tank top at the cut back. The plate girders are surmounted at the top by a 6 in. x 6 in. x 5/8 in. double riveted continuous angle and a continuous top rider plate, 1 in. thickness, double riveted to the angles, with rivets having flush countersunk points at the top surface. The whole connection is made water tight. The ends of the girders are tapered down from the rider plate to the tank top. The girders are fitted with diaphragm plates and brackets at and between each transverse, consisting of 1/2 in. plating with double attachments to the girder webs of 3 1/2 in. x 3 1/2 in. x 1/2 in. angle. The diaphragms and brackets are flanged at the throat.



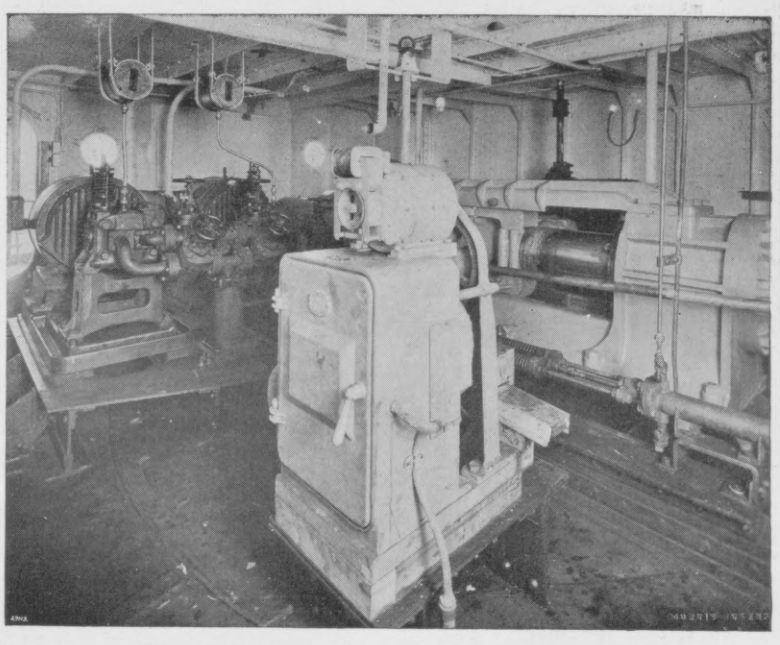
Sperry link to steering gear

Between the webs of each girder at each diaphragm there is fitted a 1/2 in. separator plate, having double 3 1/2 in. x 3 1/2 in. x 1/2 in. angle clip connections to the web and rider plates. On the outboard sides of the girders, the transverse members in way of the generator compressor unit foundations are made in diaphragm form, with adequate connections to these foundations; abaft and at transverse No. 30, the members are of similar form, attached at outboard ends to the bottom brackets of the side transverses and carried intercostally from side to side of the ship. All connections of the foundation to the tank top have their flanges cut back a sufficient amount to provide adequate drainage of the bilge water. In order that the spaces under the engine may be entirely and easily accessible for painting, etc., suitable access holes are arranged. The top surface of the rider plates of the foundation is at a distance of about 1 1/2 in. below the bottom face of the engine bedplate and for alignment and checking at the holding down bolts, wrought steel or cast iron "hand fitted" chocks are installed. The space between adjacent chocks is fitted in with pine blocking, arranged so that when the nuts of the holding down bolts are released the top surface when inserted is 1/16 in. higher than the adjacent chocks.

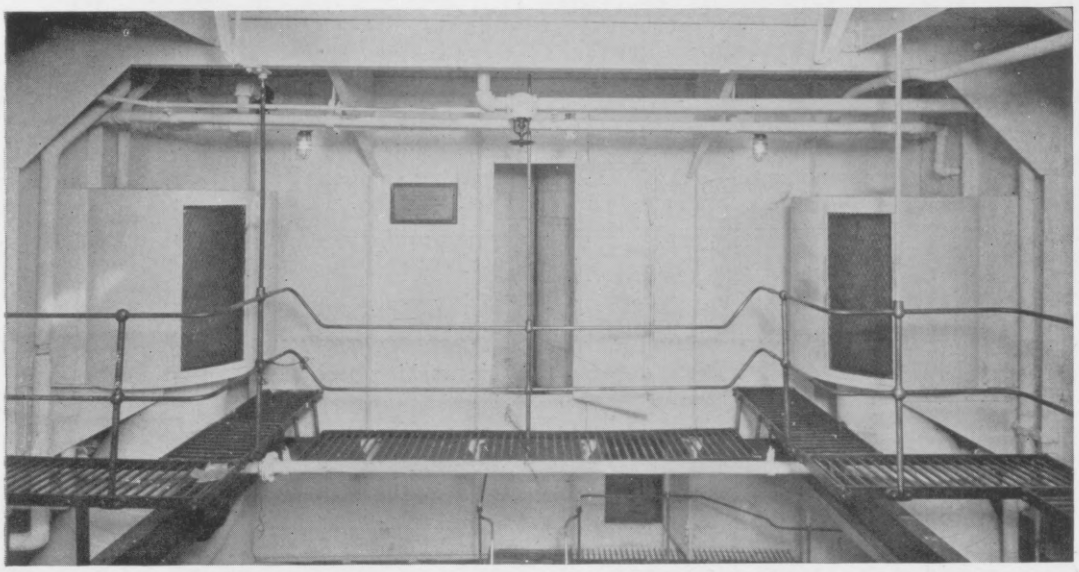
The main engines on Ms. E. T. Bedford



Binnacle, telemotor gear and Gyro equipment



Steering gear with power unit of Gyro equipment



Scavenge air intakes and muffler house in engine room casing

were built by Busch-Sulzer Bros. Diesel Engine Co. of St. Louis, Mo., and are of their standard single-acting 2-cycle, heavy duty, crosshead type, with self-contained scavenge pump and air compressor each directly driven by its own separate crank at the forward end of the engine.

Each engine is guaranteed to deliver 1500 b.hp. at 90 r.p.m., but will develop 1800 b.hp. when needed. It is built as a 4-cylinder unit of 30 in. diameter and 42 in. stroke. The power at 90 r.p.m. requires unusually low m.i.p. and piston speed, which indicates the conservative basis on which the engines are rated.

Construction details show a crankcase of box frame enclosed type with girder construction. It carries four crosshead guides per cylinder, with equal area on both sides. There are no loose or adjustable pieces on the crosshead shoes, as shims are provided behind the stationary guides. The crankshaft is made up of solid forged sections bolted together. The two main sections are interchangeable, and one forward section is used for driving scavenge pump and compressor.

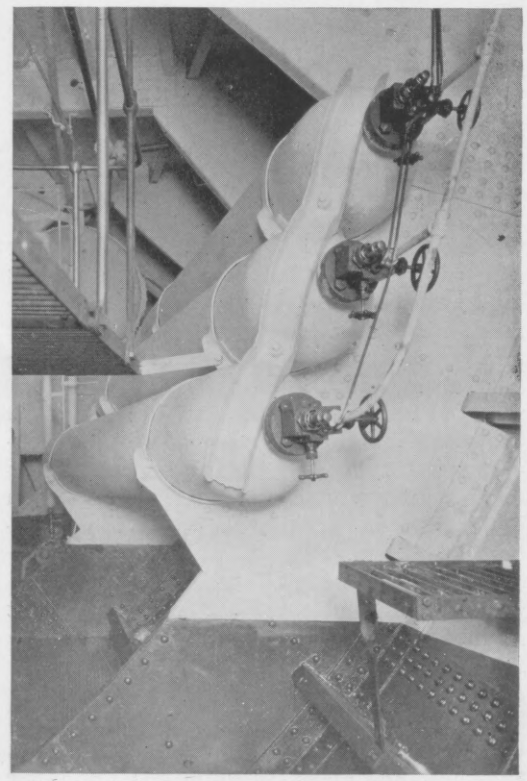
The injection air compressor is of 3-stage type and is of sufficient capacity to handle both engines. Air coolers of the straight tube type are mounted vertically and have sufficient capacity to reduce the temperature after each stage of compression to that of the atmosphere. The scavenge pump is tandem double acting, fitted with automatic plate valves of same design as those on the upper tiers of the cylinder inlet ports.

Cylinder heads are symmetrical through any section and capable of withstanding expansion stresses due to high temperatures. There is only one opening through the head, and this is located in the exact center, for insertion of the single cage which carries both the fuel valve and air starting valve. With the camshaft located directly along the front of the cylinder heads the fuel valve lever arm is actuated directly by its cam.

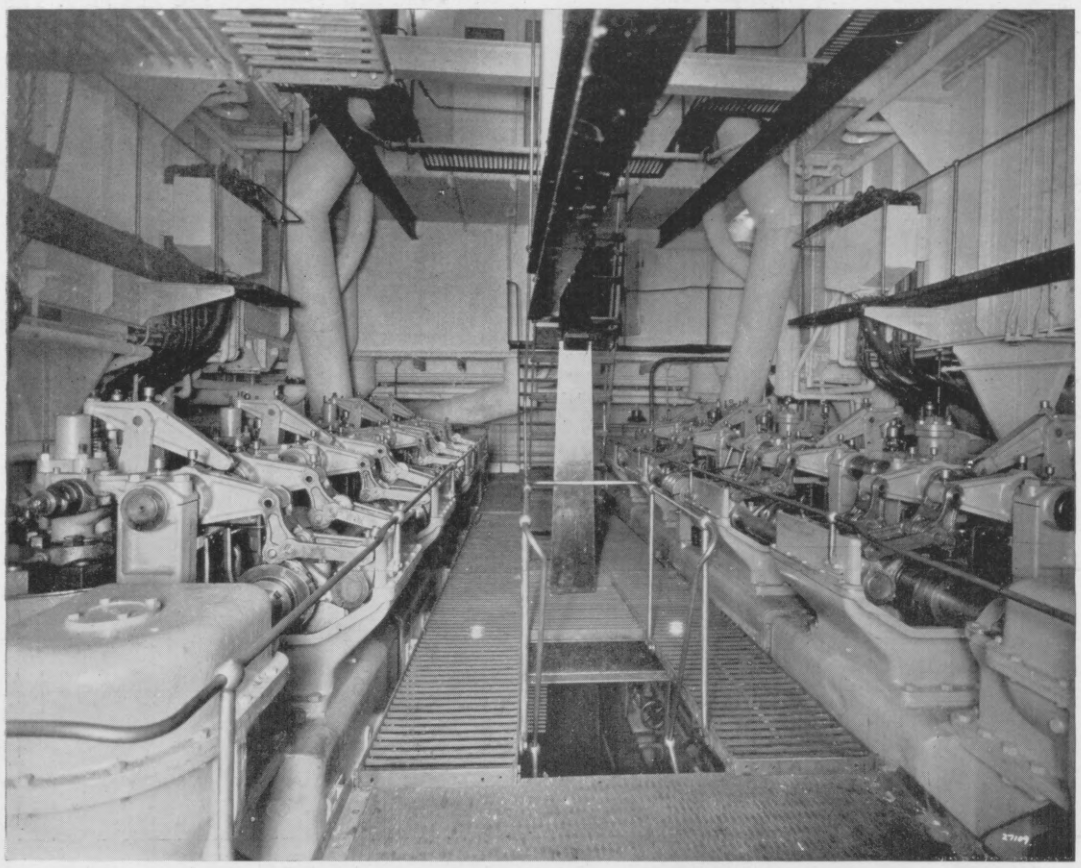
Pistons are water-cooled through telescopic tubes with long overlap and with ample provision against leakage of water into the crankcase.

The fuel pumps, situated at the flywheel end of the crankcase, are of the constant stroke type, with controlled seating of the suction valves for the desired engine speed. This speed is controlled by the operator from his stand in front of the engine; while an over-speed governor, which makes the pumps inoperative, prevents the speed from exceeding a predetermined maximum. Exhaust pyrometers with dials on the gauge board permit the pump to be set with great precision, thus providing quick means of insuring uniform cylinder loading.

Lubrication is provided for the main,



Injection air bottles on transverses

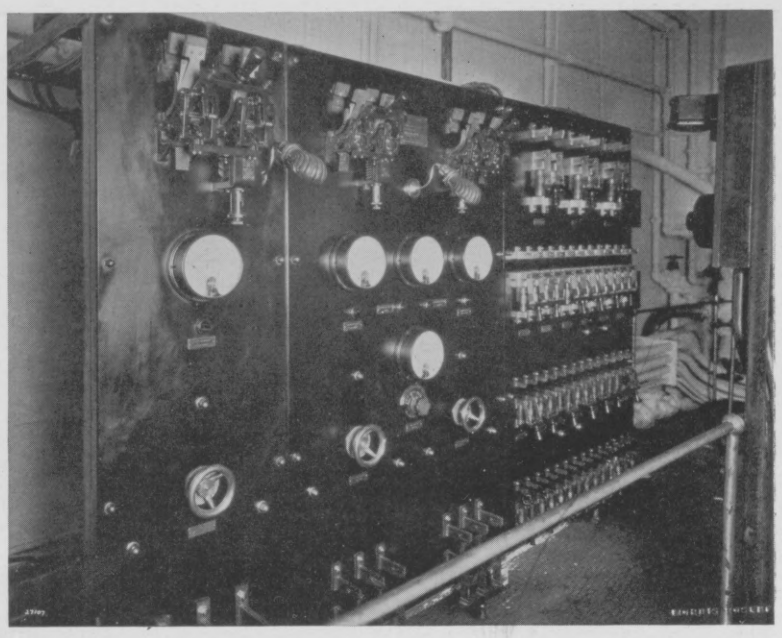


Cylinder tops of ms. E. T. Bedford's two 6-cylinder 1500 b.hp. Diesels

crank and crosshead pin bearings by a continuously circulating system under pump pressure. A geared rotary pump supplies the oil at about 10 lb. pressure for the main and crankpin bearings, while a plunger pump, taking its suction from part of the discharge of the rotary pump, provides oil for the crosshead pin bearings. This system not only lubricates the bearings, but continually flushes and cools them. After the oil is forced through the bearings it collects in the bedplate whence it flows to the sump tank. Here it releases the entrained air and foreign matter and the pumps draw it up through a twin filter and then force it through a cooler into the headers which branch to the bearings. Cylinder walls are lubricated at eight points on the circumference by means of a Manzel positive sight-feed lubricator. As this oil is applied in a most efficient way possible, its consumption is kept at a minimum and the serious consequences of over-lubrication are guarded against.

Reversing of the engine is accomplished without shifting the camshaft and by means of double sets of cams. Two rollers —one for forward and one for astern—are

Rotary pumps at forward engine room bulkhead



Main switchboard showing generator panels

carried on a small bell crank supported at the outer end of each lever.

Air for starting is controlled by a single hand wheel which by connection to an air operated servo-motor automatically brings the proper rollers into contact. Within 10 sec. the engine can easily be reversed from full speed ahead to full speed astern, or vice versa. From his control station in front of the engine at floor level, the operator can start the engine in either direction and control its speed from normal to about 25 per cent of normal.

The engines of Ms. E. T. BEDFORD are not only self-contained as regards scavenge pump and oversize air compressor, but also lubricating oil pumps and cooling water pumps (both salt and fresh water). A fuel consumption of 0.425 lb. per b.hp. hour was obtained on test. Engines of the same type and design—but with six cylinders—furnished by the same builders for the Shipping Board showed an average fuel consumption of only 0.413 lb. per b.hp. on 30 day full load test. On the Shipping Board engines the air-compressors are not of double capacity and the cooling water pumps are independently driven.

During shop tests, even at an overload of 60 per cent the exhaust was almost invisible, and through the whole range of powers the operation was quiet and free from vibration.

The engines of Ms. E. T. BEDFORD, have been guaranteed for operation on heavy fuel oils, and suitable heaters have been installed to keep the fuel in a free-flowing state all the way to the fuel valves.

Power for driving the electrical auxiliaries is supplied by two 50 kw. generator-compressor sets arranged one on either side of the main engines and each driven by a 3-cylinder 150 hp. Nelseco Diesel. Aft between the two main engine shafts is a third Diesel generating set of 100 kw. output also driven by a 150 hp. Nelseco Diesel. This unit does not drive a compressor unit.

The injection air flasks are attached by means of especially constructed chocks to transverses on either side of the main engines. Along the forward engine room bulkhead is arranged a line of motor driven rotary and centrifugal pumps, while in the port forward wing of the engine room is the heating boiler compartment mentioned above. This compartment contains a motor driven feed pump and a fuel oil pump.

The main switchboard is on a flat at the forward end of the engine room above the line of pumps.

The boiler equipment, which has been mentioned briefly already, is in a compartment at upper deck level and this supplies steam for a certain number of stand-by auxiliaries, for the cargo oil pumps which were originally on the ship, and for tank heating purposes.

Equipment outside the engine room is substantially the same as it was before the ship was converted. The original steam windlass has been retained and is driven by a steam prime mover on the deck below through gearing, in a manner reminiscent of modern electric windlass practice. A recess is arranged in the forecastle bulwark plating to bed two anchors with stocks whose housing is taken care of by a steel crane. These are necessary adjuncts to a ship which possibly has to load oil in open roadsteads and to remain at anchor while doing so. The original warping winch aft is retained and also the winch with extended barrels which operates derricks attached to the ventilator posts leading into the pump room. These derricks handle heavy shore line connections.

The steering gear is a Hyde hydro-electric unit linked up with Sperry two-unit gyro equipment. The forward or wheel house unit of this equipment is mounted on the port side of the telemotor and the after or power unit is mounted in the steering compartment aft. The wheel house unit is arranged so that it can be used to steer the vessel manually by means of the steering wheel provided on the gyro-pilot, or automatically by simply moving a lever on the side of the pilot stand to "Wheel" or "Gyro" as desired. By moving this same lever to "Off," the gyro-pilot system is entirely disconnected from the ship's hydro-electric telemotor system thus permitting the ship to be steered by the telemotor independently of the gyro-pilot system. The ship is thus provided with two completely independent means of manual steering besides the automatic steering which controls the steering machinery directly.

On the docking bridge aft is an emergency steering gear. In the charthouse there is a Sperry automatic course recorder operating in conjunction with the gyro-pilot. There is also a radio compass.

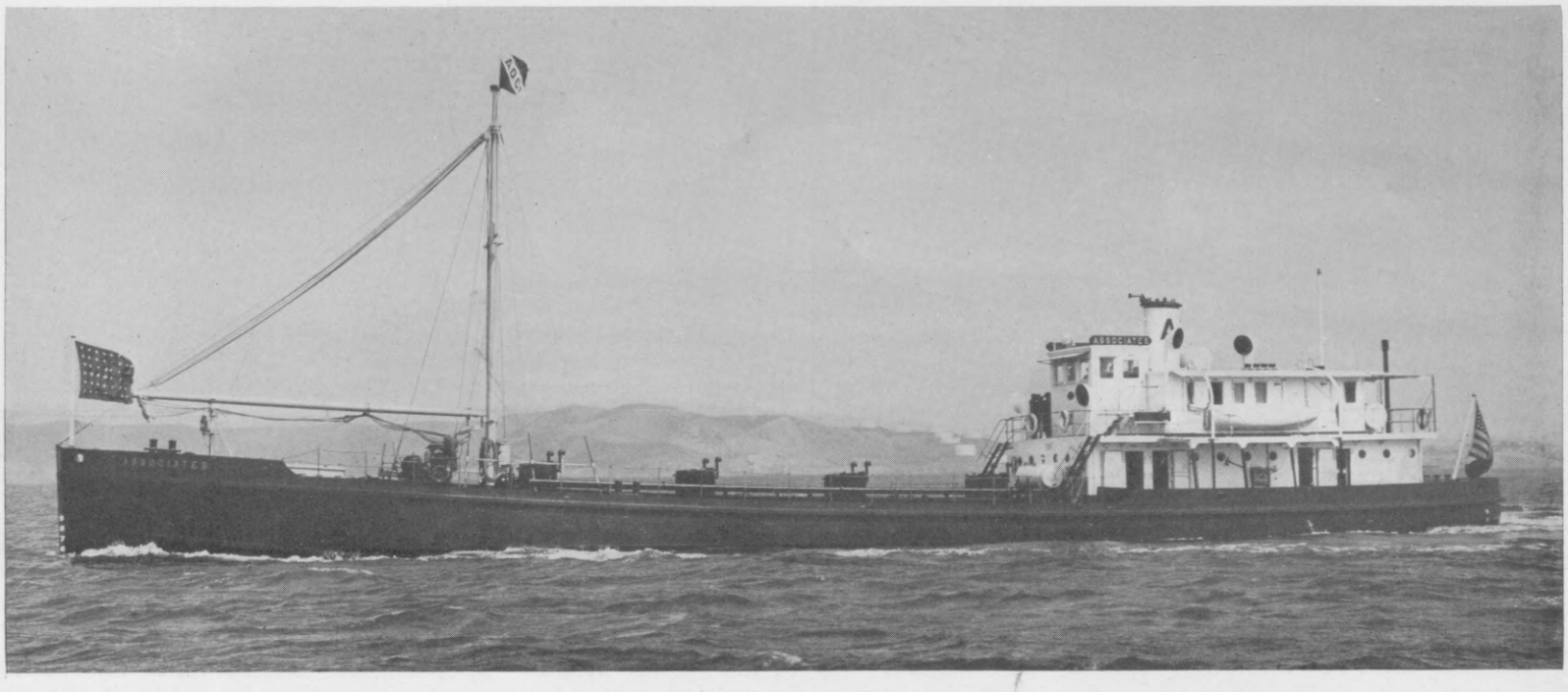
A very complete fire extinguishing system of Lux type is provided. A total of 118 Lux cylinders is installed on the upper deck in banks of 10, 11 and 12, depending on the spaces protected. Control of the whole system extending to every part of the ship is embodied in a set of pull handles located in the aft passageway of the bridge deck.

Each control handle releases a bank of cylinders directly connected with the cargo oil tank indicated on its name plate. In case of motor or pump room fire it is first necessary to close valves whose stems extend through to the shelter deck and which are in the tank lines, open the direction valve of the space on fire and pull the control handles with a number noted on the instruction chart.

In the Lux system carbon dioxide cylinders are located in some protected space and manifolded together in batteries. Each Lux cylinder is provided with a special valve and quick release mechanism permitting the discharge of any amount of carbon dioxide necessary to extinguish fire in less than 30 sec. Release is accomplished by remote control. The carbon dioxide is conveyed through pipes to the space on fire and ejected through special nozzles. Liberation of the carbon dioxide changes it instantaneously to a gaseous state and expands it 450 times its original stored liquid volume.

Ms. Miller County Sold

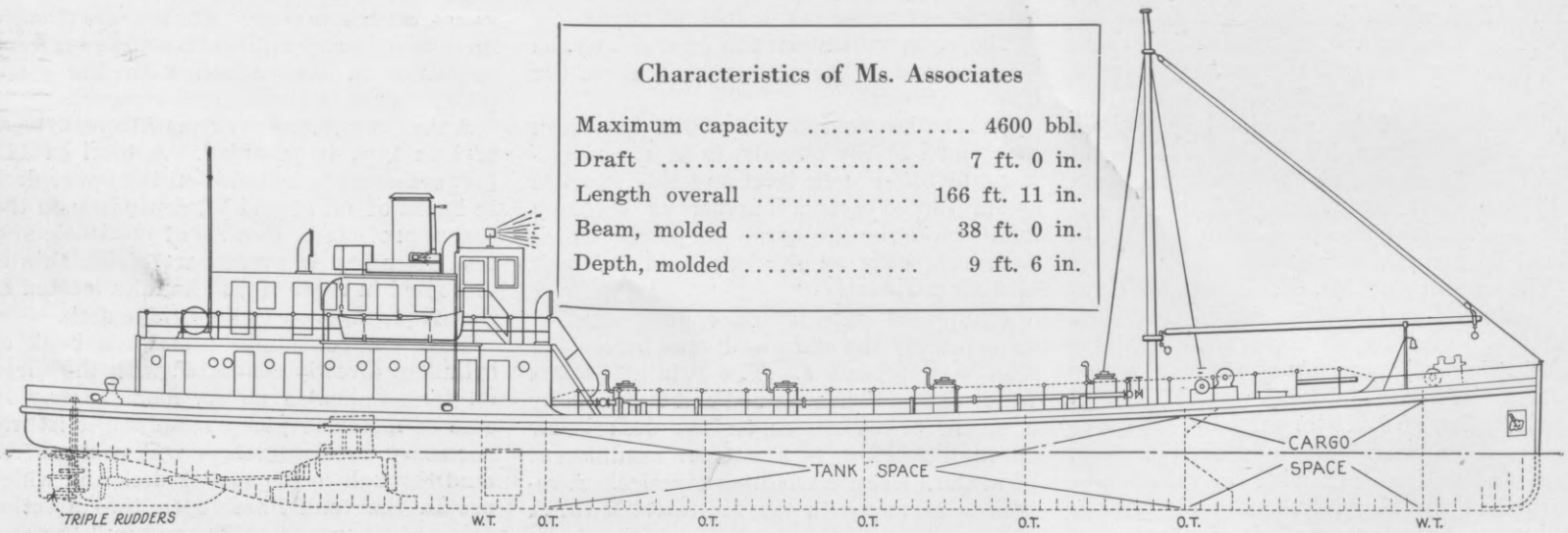
MILLER COUNTY, the tanker of 10,250 tons d.w.c. converted by the Sun Shipbuilding & Dry Dock Co., in 1923 has been purchased by the Standard Transportation Co., the marine subsidiary of the Standard Oil Co. of New York. The vessel has been renamed AURORA. Her gross register is 7050 tons and her registered dimensions are: length, 431.0 ft.; breadth, 52.2 ft.; depth, 33.3 ft. With a Sun-Doxford engine of 2500 b.hp., she makes a good 10 knots.

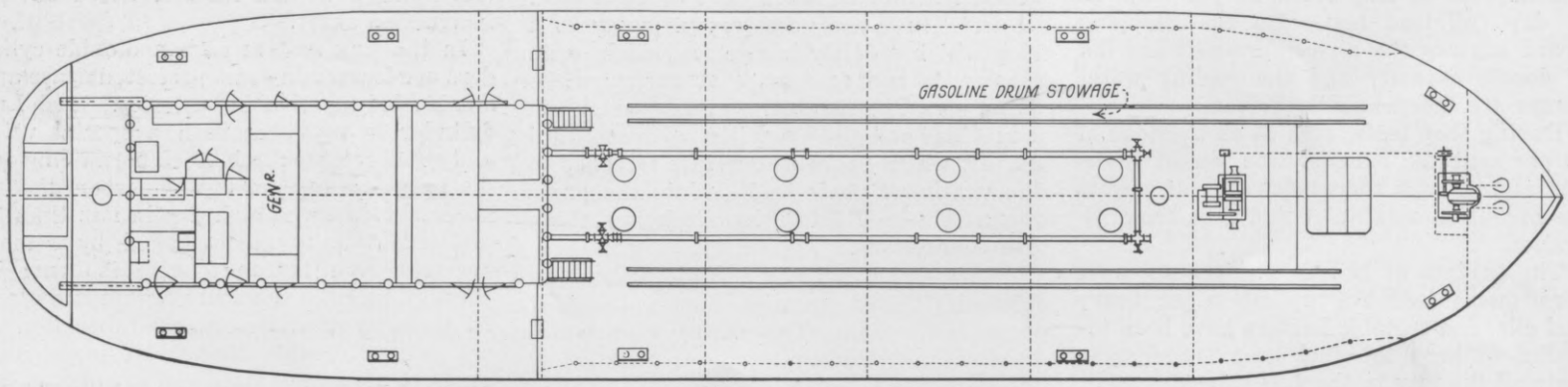


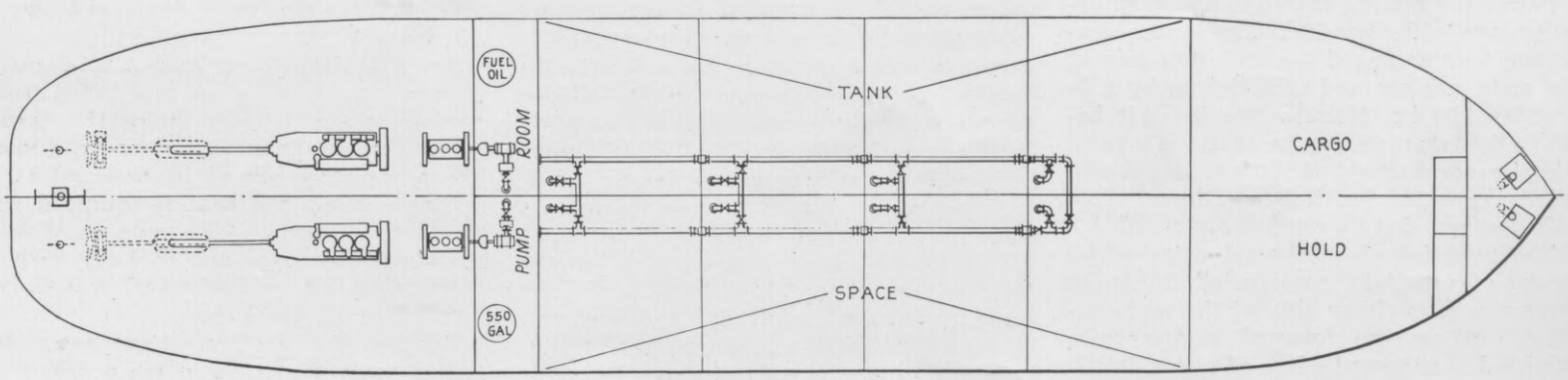
Ms. Associates, one of the latest additions to San Francisco's fleet of tankers for bay service is powered by two 3 cylinder Diesels

Characteristics of Ms. Associates

Maximum capacity	4600 bbl.
Draft	7 ft. 0 in.
Length overall	166 ft. 11 in.
Beam, molded	38 ft. 0 in.
Depth, molded	9 ft. 6 in.







Twin Screw Shoal Draft Diesel Tanker

Latest Ship for Associated Oil Co.'s San Francisco Bay Service Carries 4600 bbl. on a 7-ft. Draft

TWIN 3-cylinder Union Diesels form the main power units of Ms. ASSOCIATES, a bulk carrier of refined oil, constructed at Bethlehem S. B. Co.'s Union Plant, San Francisco, for the shallow waters of San Francisco Bay and its tributary rivers. The owners of the vessel are the Associated Oil Co. of San Francisco.

This barge, one of many Diesel powered boats for similar duty in operation on San Francisco Bay, has been designed to carry a maximum cargo of 4600 bbl. at 7 ft. draft when operating on San Francisco Bay. For river work a normal load draft of 6 ft. 2 in. will permit carrying 2500 bbl. of gasoline in shallow river waters. In order to fit these conditions the vessel has an overall length of 166 ft. 11 in., a beam of 38 ft. 0 in. and a depth molded of 9 ft. 6 in. She has a high block coefficient, but the 110 hp. of her two propelling units gives her a loaded speed of about 7 knots.

Shallow draft service conditions make it necessary to adopt twin screws for propulsion and has called for a cutaway stern of cruiser type above the water line with three rudders, one main rudder being on the centerline and one small rudder being arranged abaft each of the propellers. In this Ms. ASSOCIATES differs from some of the other vessels constructed for bulk oil carrying on San Francisco Bay, some of which have single screws direct coupled to a Diesel engine and others a single screw direct coupled to an electric motor, taking current from two Diesel generating sets. These vessels have ordinary type counter-sterns, with single plate rudders.

Ms. ASSOCIATES has her machinery located aft, with a pump room forward of the engine room. The pump room actually forms a cofferdam 'tween the machinery and cargo spaces. A small cargo hold located forward of the oil tanks, of which there are four double units, handles case goods. The engine room is occupied by the two 3-cylinder Union Diesels. Each engine carries its own clutch and reverse gear pot on a bedplate extension, the clutch and gear pot being actuated by an air ram. A very simple control is thus obtained.

To vary the engine speed the operator simply manipulates a speed control lever, which controls the fuel pump pressure and the lift of the fuel valve needle simultaneously. A second control lever is arranged so that it may be placed in three positions. One position permits the engine to idle without rotating the propeller. The second position engages a clutch which rotates the propeller in ahead rotation. The third position causes the engine power to pass through the reverse gears, thereby operating the propeller in astern rotation.

Two 30 hp. 3-cylinder Standard gas engines are installed in the engine room for the purpose of driving Kinney pumps in the pump room. These pumps are of the 10 in. x 5 in. rotary type with 100 lb. working pressure.

A gas engine driven compressor is installed in the engine room for charging starting air tanks, and a Gould bilge pump is arranged to be driven from one of the cargo pump engines.

A Union direct connected generator set, consisting of a 7 hp. gas engine and a 3¾ kw., 125 volt generator, is located on a dynamo flat. A Sharples super centrifuge is also installed on this flat for the purpose of purifying lubricating oil.

An air-operated steering engine is placed below the pilot house deck, arranged to control the three rudders.

The vessel is arranged to be as comfortable as possible in hot weather, and awnings are provided to shield the living quarters from the hot Sacramento Valley sun. A well equipped galley and a large refrigerating space is also provided for the crew.

ASSOCIATES is an ideal craft for her particular service and as a result of the care devoted initially to her design is operating very satisfactorily.

Largest Dipper Dredge Is Diesel-Electric

UTILIZING a dipper pull of 350,000 pounds—more than the pull of the largest dredges used in the construction of the Panama Canal—the Diesel-electric dredge CREST is now being used for rock removal work in New York harbor off Staten Island. This dredge, 167 ft. in length and 48 ft. beam, is the largest and most powerful dipper dredge ever built.

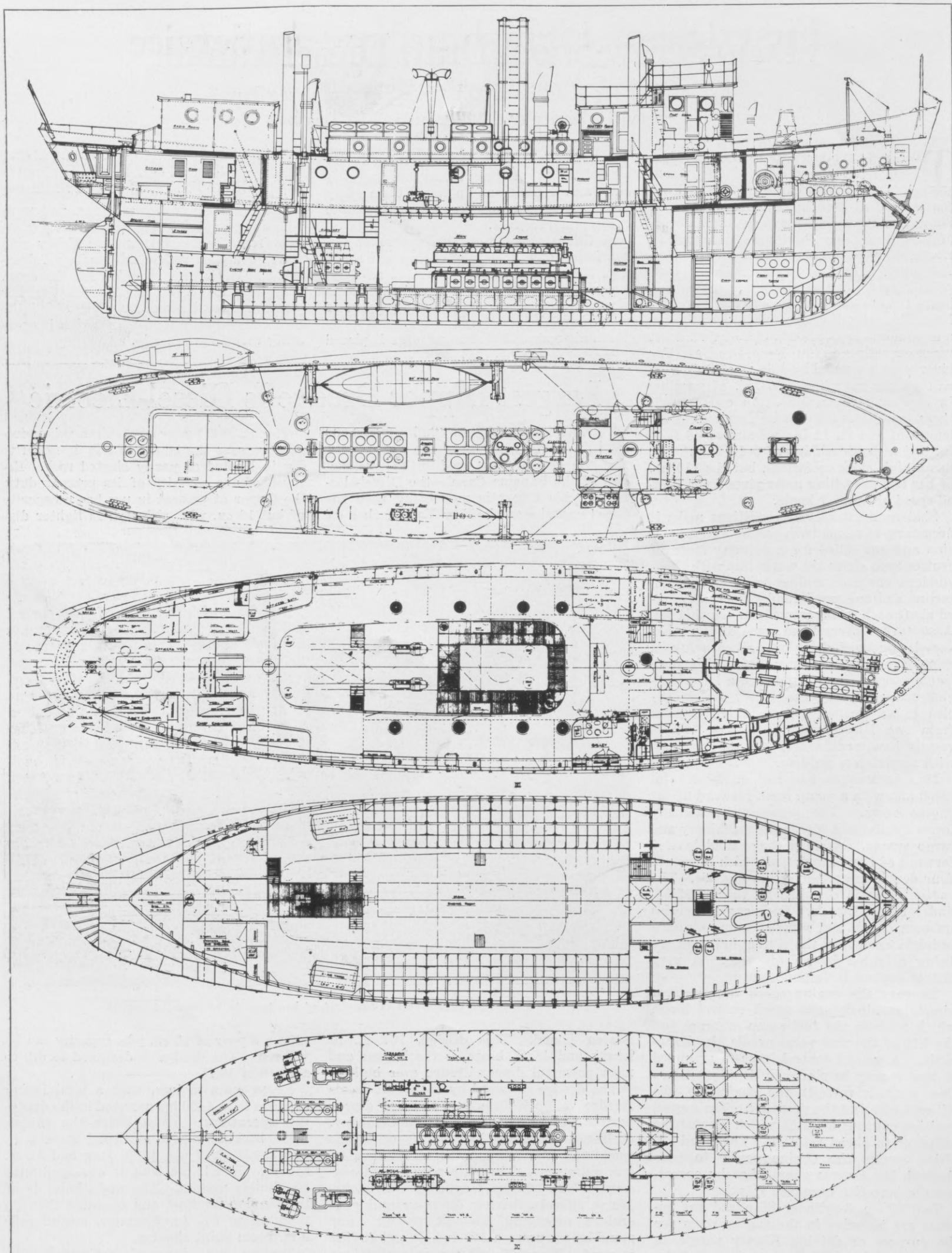
The dredge is owned by the Great Lakes Dredge & Dock Company and the dipper portion was built by the Bucyrus Company. It is not self propelling but is otherwise completely electrified, using General Electric equipment. The main power plant consists of two 600 hp. 6-cylinder Fairbanks-Morse Diesels, driving direct-current generators supplying 230-volt power. For stand-by purposes a 120 hp., Diesel engine is used. Two 125-volt generators, driven by two 7½ hp. Diesels, furnish lighting. American Brown Boveri Corp. built the hull.

The unusual power of the dredge is necessary because the equipment is designed to dig in blasted or partly blasted rock. Because of the severity of its present duty, the dipper at present in use has a capacity of but 10 cu. yds., although in lighter digging a dipper of 15 cu. yds. capacity can be utilized. The dredge is designed to dig to a depth of 52 ft.

Dipper Dredge Crest is the first of her type to be Diesel powered

Seven main motors, with a total rating of more than 1400 hp. are used in the dredging operations. These drive the thrust, hoist, backing, swing and spud machinery. The spuds alone are 85 ft. long and 51 in. square. In all, the boat is equipped with 35 electric motors. The main hoist is of the single-part type and operates through twin cables 2⅜ in. diameter, reeved over 9 ft. boom point sheaves.

Besides the electrical equipment described, many conveniences are provided for the crew.



General arrangement of the first American Diesel powered light vessel now on station 20 miles off the Delaware Breakwater

First Diesel Lightship Now in Service

Diesel Engine Economy Convinces Bureau of Lighthouses All New Lightships Should Have Oil Engines

WHEN Lightship No. 111 left the yard of the Third Lighthouse District, New Brighton, S. I., to go to her station at North East End, 20 miles off the Jersey Coast, near the mouth of the Delaware River, she carried in her fuel tanks 48,000 gal. of oil—sufficient fuel to enable the whole of her machinery to operate for one year without any assistance from outside sources. This is but one advantage of many which the use of Diesel power for main propulsion and the use of Diesel-electric power for the whole of the other mechanical services of the ship has given. These economies are convincing the Bureau of Lighthouses that all new vessels should have oil engine power.

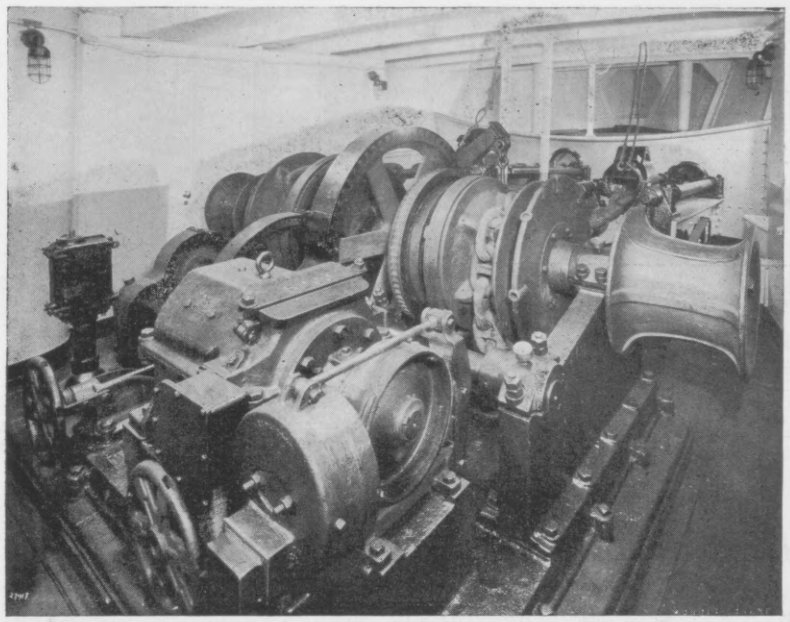
Lightship No. 111 is noteworthy in that she is the first Diesel lightship on this side of the Atlantic and she represents a definite step forward in the technique of coastwise lighting. There are many fine and well-fitted light vessels around the coasts of the United States, but they tend to become obsolete when compared with this new development. All American lightships have power for self propulsion in addition to the power required for maintaining the lights operating compressors for fog signals and working submarine bells. Propulsive power is useful to enable the vessel to proceed to and from her station, which she does normally at the end of a year's service. It is also of extreme value in cases of emergency where wind, wave and tide may cause her to drag the strongest mushroom anchor. To be instantly available a steam plant such as is fitted in the majority of existing vessels must keep boiler fires constantly banked, and even then as long as half-an-hour may be required to bring a full head of steam to the main engine stop valves. Then, too, when fog suddenly comes down the fires have to be increased in intensity in order to put steam on the compressor. Alternatively if a steam generator is used this is required to be kept going all the time. In any case a light vessel with steam power is consuming fuel from the time she goes on station to the time she is relieved.

The new vessel we have under consideration, however, is subject to none of these uneconomical processes. The main Diesel is started up at the yard and propels her to her station. Here it is shut off and with the exception of occasional turning over does not cost one cent for fuel and practically nothing for upkeep until it is required to take the vessel off station again in one year's time.

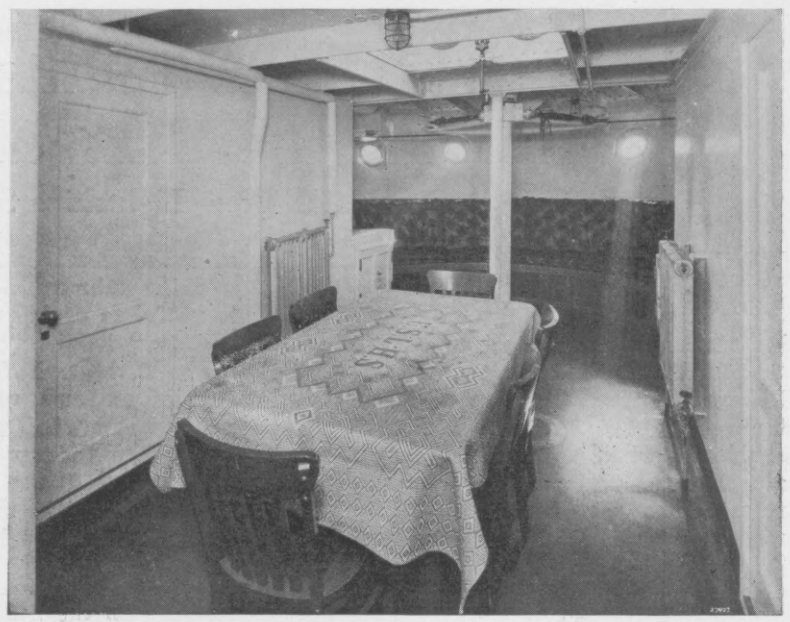
During the day in normal weather no machinery is in use on the ship at all and the only fuel consumed is in winter, when a nominal amount in a heating boiler for the quarters is consumed.

Light vessel No. 111 has an 8-cylinder, 450 b.hp. Winton Diesel for main propulsion. This, with its necessary auxiliary machinery and the heating boiler, is arranged in a watertight compartment flanked by fuel tanks forward of an auxiliary engine room and in communication with this latter through a water-tight door. The auxiliary engine room contains two 25 kw. Diesel generators each driven by a 4-cylinder Winton Diesel. These are used for supplying current for motors which drive the principal pumps in the ship and the compressors for the fog siren. They are only used in foggy weather and for a short time each morning for pumping out the ship. The fog siren compressors and the main pumps are all situated in this auxiliary engine room grouped around the two

Diesel power has permitted many design improvements in Lightship No. 111, *first oil engine powered light vessel in U. S.*



Powerful electric windlass for main and auxiliary moorings



Comfortable quarters are a feature of the ship

generators. The compressors are each driven by a 20 hp. Diehl motor and they supply air at 40 to 50 lb. pressure to the siren. One compressor is arranged on the port side and one on the starboard side forward. Here are also on the port side a Viking rotary fresh water pump, a fire deck and bilge pump, while on the starboard side there is a similar arrangement except that the rotary pump is for sanitary purposes.

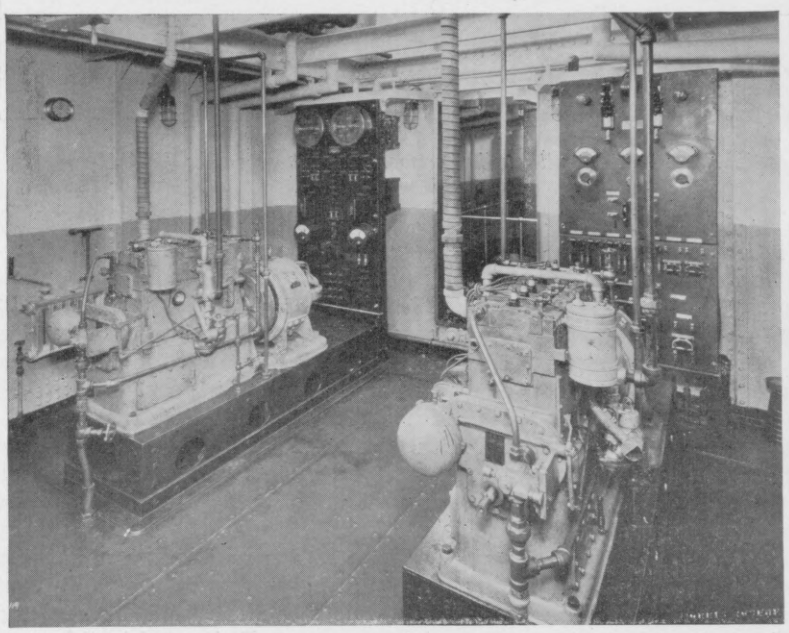
On the starboard side there is a small circulating water pump for the Frigidaire ice machine and box, which latter is arranged in the crew's quarters aft on the starboard side. Current for ship's lighting and for the main lamps are supplied by two 7½ kw. Winton-Westinghouse generator sets situated on the deck above the main engine room. These little engines run on kerosene and in normal weather are really the principal factors in the ship's operation. Each generator has its own switchboard, as is well shown in the illustration, and the port side switchboard contains the clocks operating the lantern flashing mechanism. Note that only one lantern is in use at a time, although in conformity with U. S. light vessel practice there are two lanterns, each arranged on a steel mast and having a focal height of about 52 ft. 0 in.

We may digress here to remark that U. S. light vessels are the only ones in which duplicate lanterns are installed. The majority of other nations pin their faith to a single lantern of catoptric or dioptric type on a single mast amidships. The two masts on the U. S. vessels, evenly spaced on either side of a stack tend to give a very workmanlike appearance to the ship as a whole.

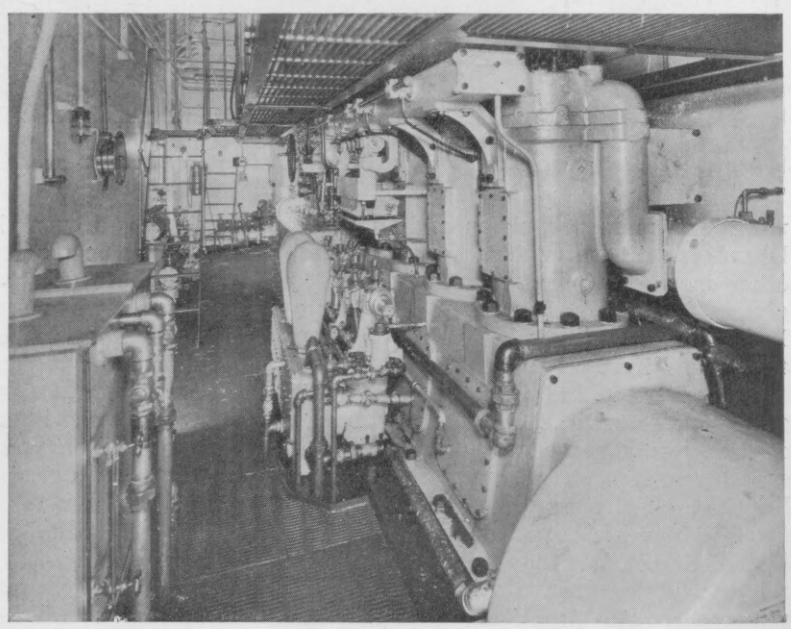
Light vessel No. 111 has two lamps of 150 watt capacity. They are of 3000 c.p. each. The two small generator sets are not run during the night but run a few hours every day in order to charge the Exide storage batteries, which take care of the light during the night. The generators are usually shut down around about 5 o'clock. On a normal clear night, therefore, after the crew has turned in, the only machinery actually in operation is the one clock which actuates the lamp flashing.

The big fog siren situated about midships differs from stereotyped practice. The disc type siren itself is situated in the base of an inverted truncated cone which actually is normal practice, but instead of the sound wave discharging into an annular orifice formed by the space between the vertical cone and another cone about 6 in. above the end, it now discharges into four definite horns. It is figured that this arrangement will give better results than the ordinary arrangement. A large deep-toned bell on the fore deck can be used in case of mishap to the siren.

The chain locker is arranged forward of the engine room and abaft the fresh water tank and cable from it is led up through a motor driven windlass to the main mooring anchor which weighs 7500 lb. and is of mushroom type. The main anchor is handled through a hawse pipe arranged as part of the stem bar, while the standby anchor is fixed to operate from a normal ship type hawse pipe on the starboard side. The windlass has two main barrels in addition to warping ends. The port side barrel deals with main anchor while the starboard one takes care of the standby anchor. Current for the operation of this windlass, which is of Hyde type, is supplied, of course, from the main 25 kw. generators. Structurally the vessel is of stereotyped arrangement and form. The hull has sturdy outlines with a sharp rise of floor and a big tumble home. Large bilge keels are fitted.



These two generators operate the lamps



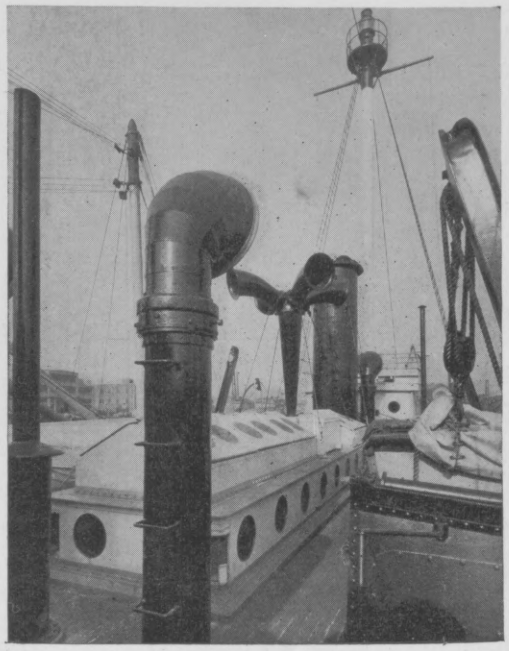
The main engine room from aft

The ship has a displacement of 750 tons in normal service conditions. She has a length on water line of 109 ft. 6 in., and a length overall of 152 ft. 10 in. The hull is of steel construction throughout and was built by the Bath Iron Works, Bath, Me., and then towed to the Staten Island yard for fitting out. There are two complete decks, all fore and aft. One deck is continuous on either side of the engine room. On the upper or weather deck is the radio room located aft, the master's room and pilot house are fitted forward.

Characteristics of Lightship No. 111

Length on waterline	109 ft. 6 in.
Length overall	152 ft. 10 in.
Beam on waterline	30 ft. 0 in.
Beam at main deck	25 ft. 0 in.
Draft	14 ft. 6 in.
Tumble home	about 2 ft. 6 in.
Power for propulsion	450 b.hp.
Light power (2 lamps)	3000 c.p. each

On the upper deck is a 24-ft. power boat used for communication with shore, a 24-ft. whale boat and an 18-ft. dory. Aft on the second deck are rooms for the first and second officers, chief engineer and assistant, officers' mess, lounging room, ship's library, bathroom, linen and medicine lockers. Located forward are the crew's quarters, two men being assigned to each room. Here also is the messroom for the crew, a well equipped galley and a bathroom. Forward of the main and auxiliary engine rooms are fresh water tanks and space for supplies. The main engine propeller shaft passes under the auxiliary engine room floor.



New style siren on main deck

The crew consists of a captain, mate, chief engineer, assistant engineer, two oilers, cook, second cook and five sailors. There is at the present moment no radio operator because radio apparatus has not been fitted. Radio quarters are provided, however, and it is anticipated that this will be done very shortly.

It may be arguable, of course, that direct Diesel propulsion for a light vessel means that the main propulsive unit is idle for a considerable portion of the year. This is correct and would seem to suggest that the ultimate aim in the economic operation of light vessels must be some form of Diesel electric propulsion in which generator sets can be started out exactly as required and an electric motor can be used for propulsion. Future developments in this direction should be carefully watched.

Survey of Motorship Activity in Continental Europe

French Yards Busy with Foreign Orders—Sweden Building Tankers and Freighters—Russia Completes Motor Tankers

OF the 16 motorships buildings, fitting out, and on order in French shipyards for French or foreign owners in the last quarter of 1926, three vessels—the coastwise freighter PAUL-EMILIE-JAVARY, the passenger liner THEOPHILE GAUTIER, and the tanker GENERAL GASSOUIN have been completed. The Compagnie Aux. de Navigation—a Paris concern—is shortly expected to place a contract with a Bordeaux firm for a 10,800-ton dw. tanker powered by two B. & W. Diesels developing 4200 collective i.hp. at 125 r.p.m. The main and auxiliary machinery for this ship will in all probability be constructed at Copenhagen. The Isherwood bracketless system of construction will be employed, and when completed the ship will be the second large motor tanker flying the French flag. As a matter of fact, there is quite a little boom in motor tanker construction in French shipyards at the present time. Ateliers at Chantiers de France, Dunkirk, are constructing an 8000-ton tanker for a Belgian firm to be powered by two Sulzer Diesels of 2800 collective hp. built at Sulzer's Saint Denis plant, where two 2500 hp. units are being constructed for two tankers for the Russian Government. These two ships are building at the Blainville Yards of the Chantiers Navals Francais. The tanker LE LOING for the French Navy was due for launching at the end of 1926, while the keel was laid recently of a 10,500 tanker for Westfal Larsen interests, Bergen. This ship will be propelled by B. & W. engines of 4250 i.hp. built at Le Creusot works of Schneider et Cie. The Brazilian coastwise motorliner ITAPAGE is still under construction at St. Nazaire. She is one of a fleet of eight similar passenger-cargo ships of about 7600 tons displacement and 14½ knots speed under construction in British, Italian, and French shipyards. ITAPAGE has two B.&W. engines of 3550 b.hp. Two high class motor freighters for the large Wilhelmsen fleet, units of which operate between New York and South America, are also building at Saint Nazaire. One is a 9500 ton vessel and the other a 7000 ton ship.

License to construct the Werkspoor Diesel has been taken out by the Société Nouvelle des Usines de la Chaléassière—a company which has been building Diesels of its own type for some years, chiefly for submarines. Werkspoor engines can now be supplied direct to ships constructing in France. In which connection, it is to be remarked that Anglo-Saxon Petroleum Co. ordered recently at Le Trait two 10,000-ton tankers—each with seven triple tanks—each powered by two 6-cylinder 2850 hp. Werkspoor Diesels. These Diesels will be constructed in Amsterdam. Of the group of vessels under review, totaling 16, only six are for French owners.

Seventh and biggest of a series of large motor tankers constructed at the Götaverken plant, commencing with the MS. HAMLET, delivered in 1916, and including the Swedish tankers OLJAREN and ZOROASTER and the Norwegian tankers RAILA and BIANCA and a 7800-ton tanker now constructing, the motor tanker of 9000 tons dw. building for Ocean Shipping Co., Oslo, will be powered by two Götaverken B. & W. trunk piston Diesels of 1480 i.hp. apiece. The vessel has a length overall of 421 ft., a beam molded of 55 ft., and a depth molded of 32 ft. She has been constructed to the highest class of Norwegian Veritas and also to fulfill the requirements of both Norwegian and British Boards of Trade. The vessel's general arrangement follows that of the stereotyped tanker with main machinery abaft the cargo oil tanks.

The Cosulich Line motorship MARIA, which recently visited the port of New York, is a modern well-fitted cargo vessel, powered by a 4-cylinder Fiat Diesel with cylinders 29½ in. diameter by 49¼ stroke, rated at 3040 i.hp., at 95 r.p.m. The auxiliary machinery is entirely electrically driven, there being for this purpose three 70 kw. generators, each driven by a 110 b.hp. Fiat engine. The vessel has a length b.p. of 400 ft., beam moulded of 53 ft., and depth moulded of 35 ft. 10 in. Her deadweight carrying capacity is 8030 tons on a normal draft of 24 ft. 10 in., the displacement at this draft being 12,500 tons. The main engine drives a 4-blade propeller, 16 ft. diameter and 13 ft. pitch.

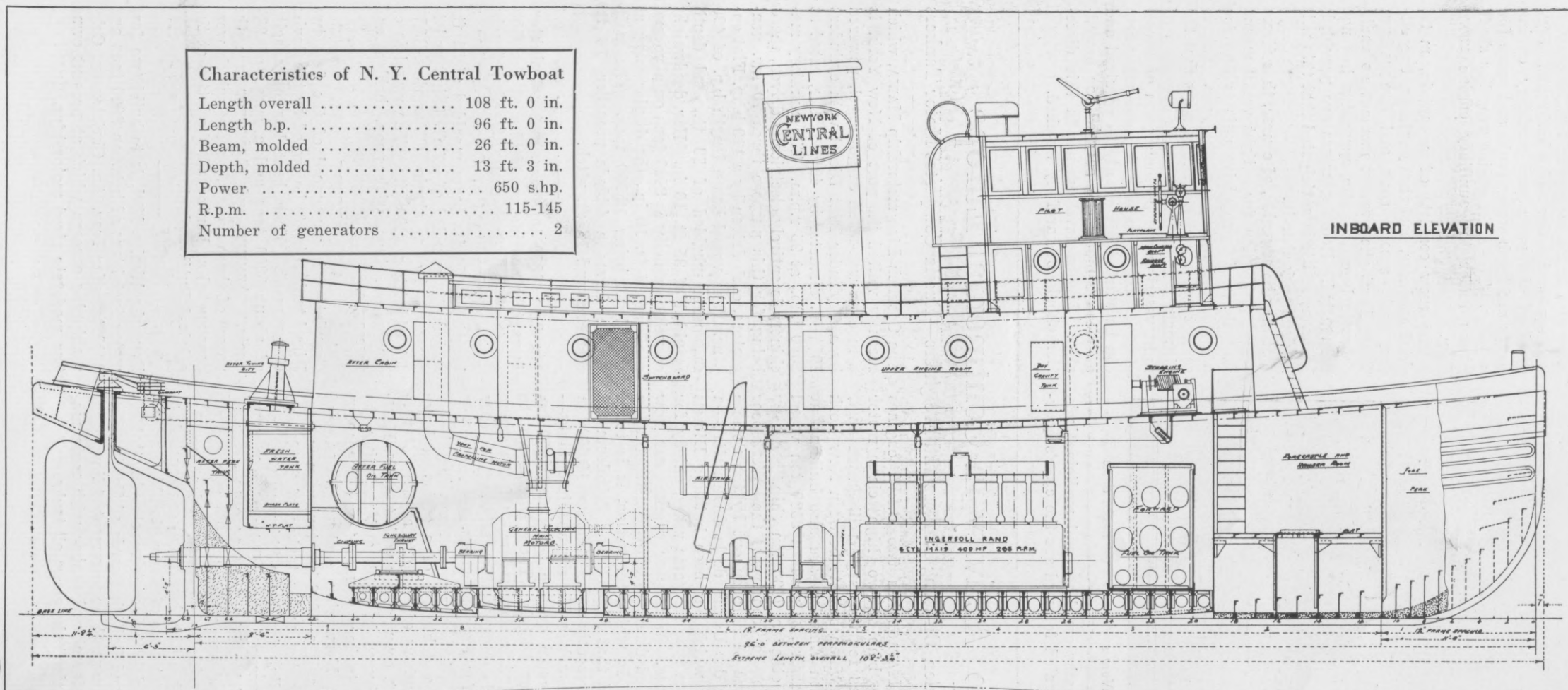
Ms. TYR, 6850 tons d.w. motor freighter, is rapidly nearing completion at the Götaverken Yard, Gothenburg, Sweden, for the Bjorn Steamship Co., Oslo. She has a length of 370 ft., beam moulded of 51 ft., and depth moulded of 27 ft. 8 in., and is powered by a single Götaverken-B&W Diesel with a 1800 i.hp. The vessel is of single-deck type with poop, bridge and forecastle.

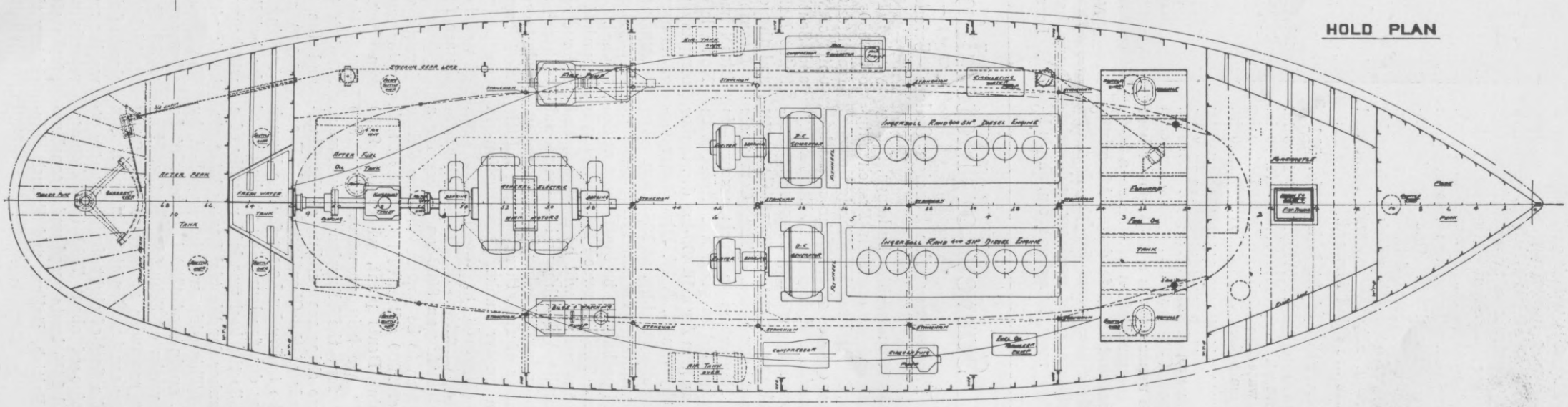
Completion is announced of the first two Diesel tank ships to be owned by the Soviet Government. Each boat has a capacity of about 6000 tons and a speed of 9¾ knots. AZNEFT and GROZNEFT are the names of these vessels, both of which were constructed at Leningrad, the latter at the original Putilov plant.

Deutsche Werke, Kiel, is to build two fast motor freighters of between 8000 tons and 9000 tons for Ivar. An. Christensen, Oslo, a shipping concern which at present owns two moderate sized motorships.

Characteristics of N. Y. Central Towboat

Length overall	108 ft. 0 in.
Length b.p.	96 ft. 0 in.
Beam, molded	26 ft. 0 in.
Depth, molded	13 ft. 3 in.
Power	650 s.hp.
R.p.m.	115-145
Number of generators	2





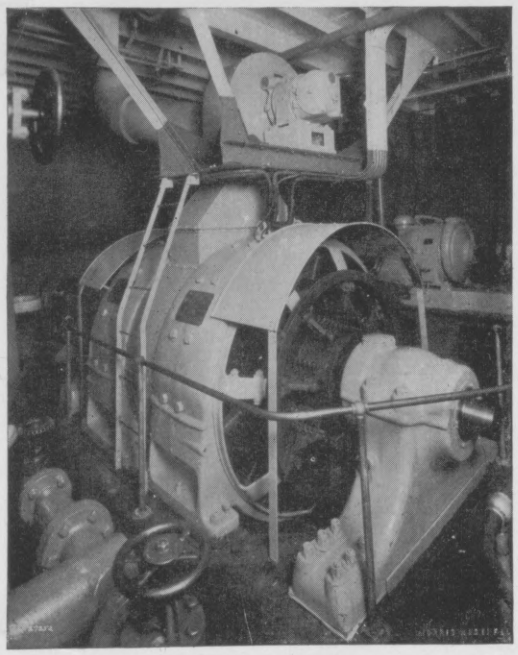
That the New York Central Diesel-electric towboats represent a considerable advance in towboat technique from all points of view is well brought out in the above

Another N. Y. Central Diesel-Electric Tug

Powerful New Vessel, Representing the Last Word in Towboat Design, Is Handling Heavy Tows with Complete Success

TWO of the largest and best equipped Diesel-electric towboats in the world are now operating in New York Harbor under the ownership of the New York Central Lines. Each is propelled by a 650 s.hp. shunt wound double armature G. E. motor, taking current from two 270 kw. generators and exciters, and controlled from the pilot house by special controls of telegraph type. These constitute a modification of controls used on many electric towboats at present in service in that each has, as our picture shows, two handles. The inboard handle in each case controls the speed of rotation of the main motor over the complete range from "full speed" to "stop". The outbound handle determines the direction of rotation of the motor either ahead or astern. Thus to go from "full ahead" to "full astern" the outboard handle must first be brought to the neutral position and then to the astern position, after which the inboard handle will be ready to operate. In other electric towboats movement of one lever from the vertical away from the operator has signified one direction of rotation, while movement towards him has given the reverse motion.

The boat illustrated herewith, N. Y. C. No. 34, is the second of her type to go on service. The first vessel, No. 33, similarly equipped in every way except that her generators are driven by McIntosh & Seymour engines, was described in January.

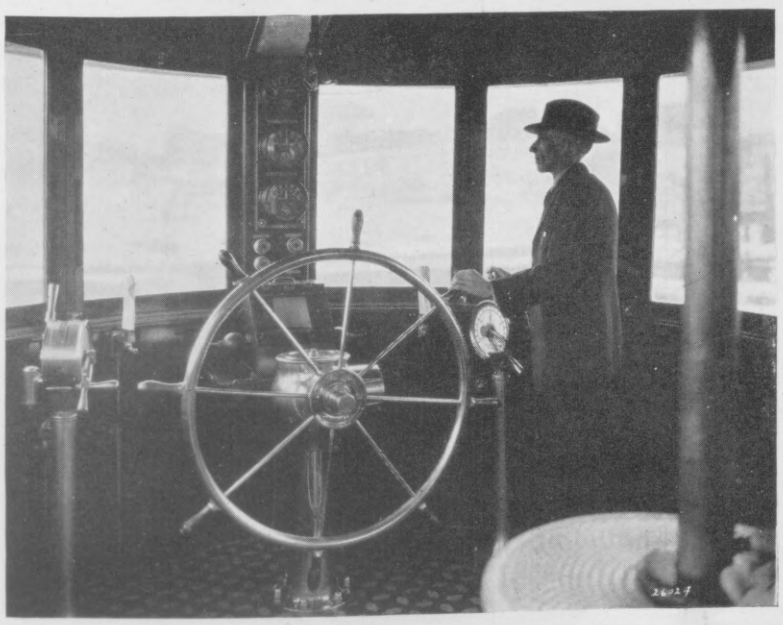


Main 650 hp. propelling motor

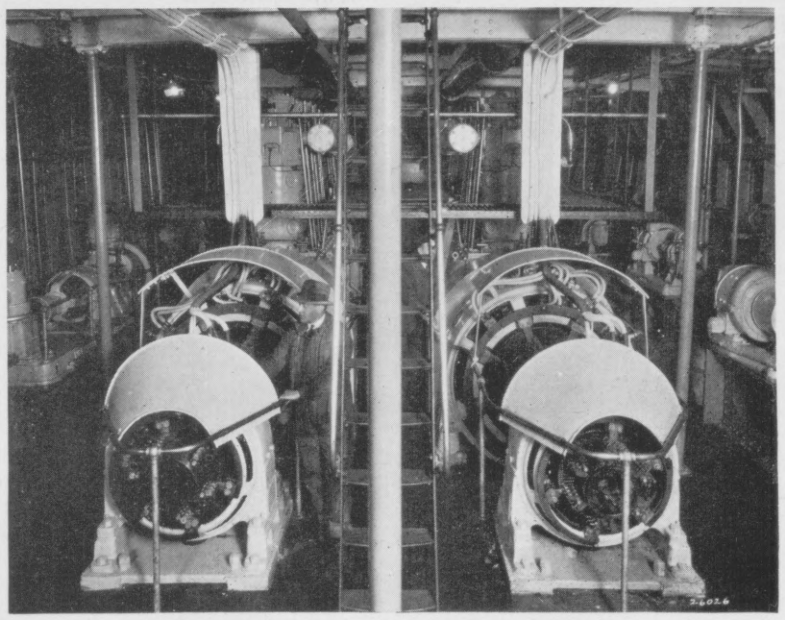
In N. Y. C. No. 34 the 270 kw. generators and 30 kw. exciters are each driven by an Ingersoll-Rand 6-cylinder Diesel of 14 in. cylinder diameter and 19 in. stroke, developing 400 hp. at 365 r.p.m. The auxiliary machinery is all electrically driven and comprise a powerful fire pump, bilge pump, circulating water pumps, fuel oil transfer pump, an Ingersoll-Rand compressor, and a compressor-generator set driven by a Hill Diesel.

Staten Island S. B. Co., who have in hand at the present time a powerful Diesel-electric tug for the Long Island Railroad, constructed N. Y. C. No. 34 as well as her sistership. Both the new vessels have been actively engaged in heavy towing work around New York harbor since their delivery.

Each ship is a well modelled vessel of all steel construction with a deck house extending over two-thirds of the length of the main deck. This house is rounded at the aft end. No wooden fenders are arranged around the ship's side. There is a special steel fender, which is, in fact, a continuation of the sheer strake, is arranged for this purpose. Generator sets are located amidships and the main propulsion motor is aft.



Shows simplicity of pilot house control



The two main Diesel generator sets

Development in Small Diesel Engines

New Line of Fairbanks-Morse Diesel Engines in 10 hp. Cylinder Size Shows Small Diesels Now on Par with Large Units

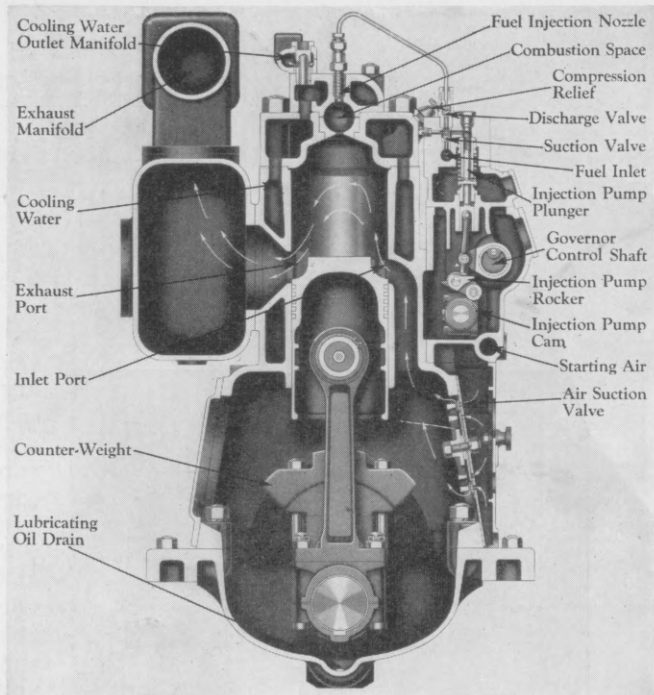
FAIRBANKS-MORSE has announced a line of Diesel engines in a 10 hp. cylinder size operating at a speed of 650 r.p.m. to be built for direct drive use in small craft and also in Diesel generating sets, where they can be used as auxiliaries in connection with the main propulsion engines. The new engine is already available in the 2-cylinder and 4-cylinder sizes, which are rated at 20 and 40 hp., and in the generating sets which are rated at 18 kw. and 36 kw., and it is expected that the 30 hp. unit and 27 kw. generating set will be brought through shortly. The generating sets operate at a speed of 800 r.p.m.

There is no question but what this new small Diesel makes available the simplicity of the 2-cycle engine in small engines which have all of the refinements of the largest Diesel engines. Although the new engines follow in general principle the lines of the 60 to 360 hp. series, they have a number of novel features because of their smaller size and higher speed.

In order to secure the maximum compactness the cylinders are cast en-bloc. This construction simplifies the design. Water piping of any kind is entirely unnecessary and the exhaust header is applied in a very simple manner. It increases the rigidity of the entire assembly and at the same time reduces the weight in lb. per hp.

Other important features of the engine include complete automatic lubrication, a simplified control arranged for both manual operation and for governor control and a built-in transmission. The lower base is of sturdy construction with heavy transverse bridges which form the main bearing supports. At the forward end of the lower base is a compartment for housing the gear which drives the lay shaft and the eccentric which drives the built-in air compressor and circulating and bilge pumps. This compartment also forms a sump for clean lubricating oil.

In arranging for the drive for the built-in compressor and circulating bilge pumps the designers have used an ingenious arrangement. The eccentric actuates a rocker arm which in turn drives the piston of the compressor through a link connection. The piston rod of this compressor is extended so that it becomes the piston rod for the pump. This pump is double acting with two sets of valves, one side of the pump being used for circulating water and the other side as a bilge pump. This arrangement is a very simple one and is compact and yet accessible.



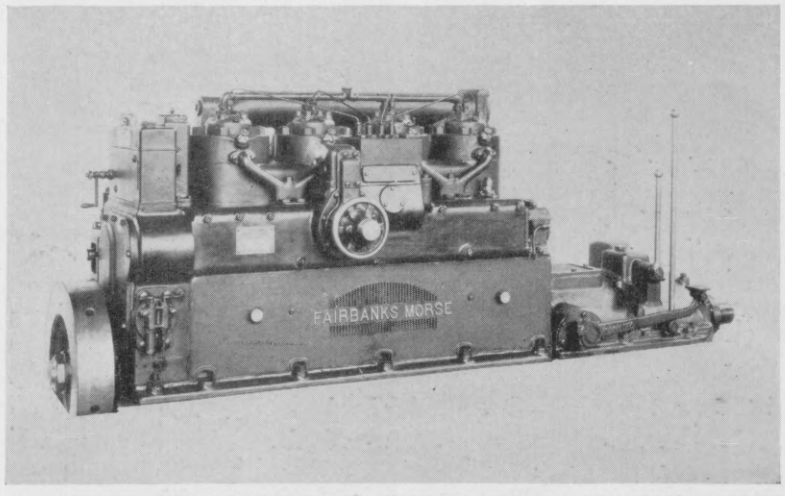
Diagrammatic section through new F. M. engine

The shaft which carries the idler gear of the lay shaft train also carries an eccentric which drives two plunger lubricating oil pumps. One of these pumps takes its suction from the crank case compartment previously mentioned and pumps the oil under pressure to the lay shaft bearings and to such rockers, rollers and pins as go to make up the injection and governor pump drives and the compressor and pump drives. The other pump takes the oil from the individual crank case of each cylinder and pumps it to the filter. Since the oil used in engines of this rating is a comparatively small amount, the filtering can be handled in batches and the oil is poured back into the main lubricating sump or to the force-feed lubricator.

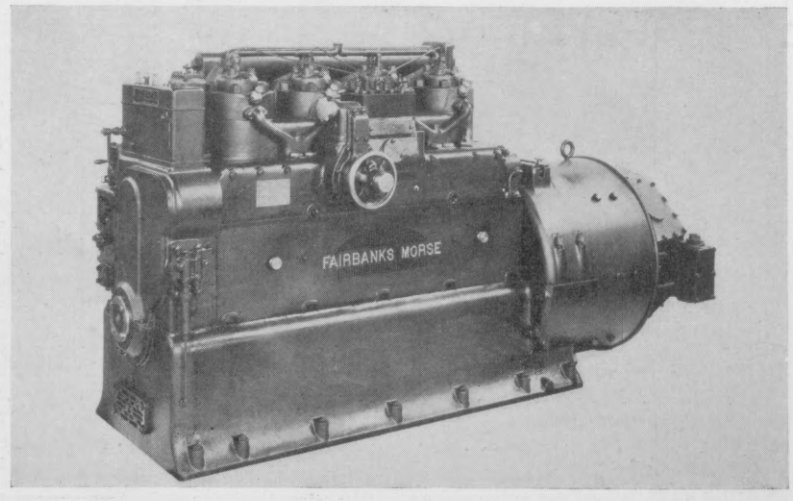
This force-feed lubricator lubricates the piston pin and the cylinders. The crank pins and main bearings are also lubricated by force feed lubrication. Control is simple and it functions so perfectly that the engine will throttle down to a very low speed and when the manual control is opened suddenly it comes up to speed much in the same way as an automobile engine speeds up when the throttle is suddenly opened.

The individual cams which operate the fuel pumps and the air starting valves are mounted on the lay shaft driven by the gear train previously mentioned. The governor is also driven by a worm gear from this lay shaft.

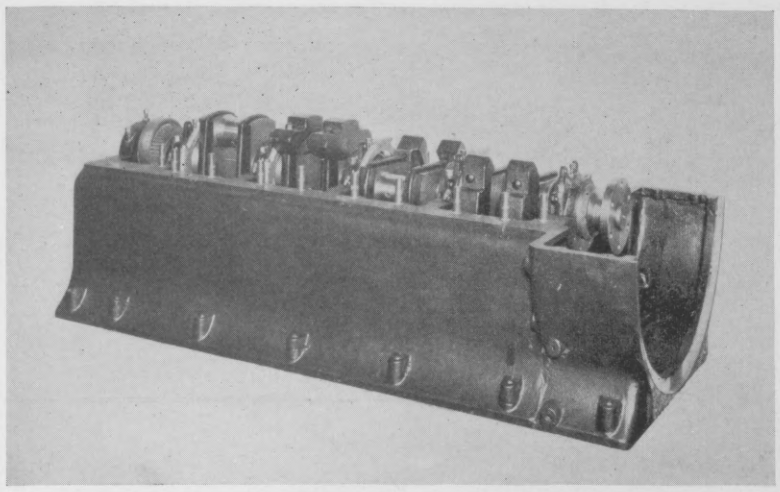
There is one important difference in the fuel injection scheme which is used with this line of engines and that which is used in other Fairbanks-Morse Diesels. The amount of fuel injected is controlled by the length of the injection pump plunger stroke and not by the closing of the suction valves. The suction valves are automatic in their operation, that is, they open and admit fuel to the barrel of the injection pump on the down stroke of the plunger. The stroke of the plunger is regulated through a very simple linkage arrangement. The governor control shaft, as shown in the accompanying transverse section of the engine, is pivoted eccentrically so that any movement of the governor weights tends to move the pump plunger push rod with respect to the cam operated rocker arm. The position of the push rod on this rocker determines the amount of fuel injected by the pump. When



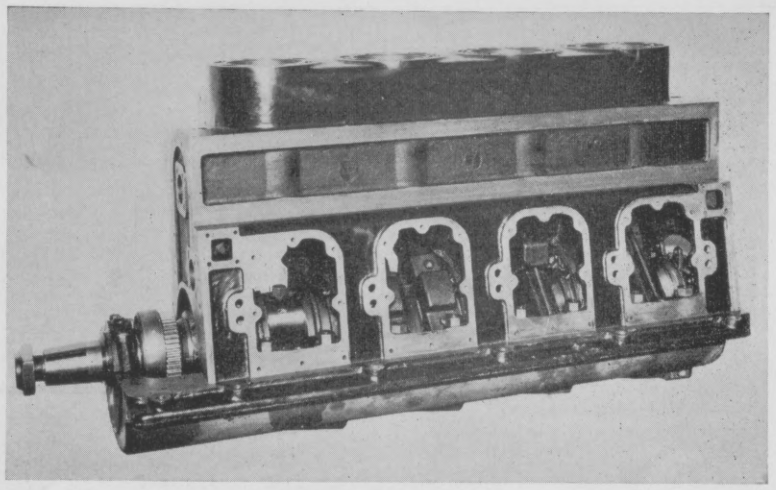
10 hp. per cylinder is developed in this unit



Compact 30 kw. Diesel generating set



Lower base and crankshaft for generator set



Upper base, lower base and crankshaft

the push rod is moving over towards the pivoting point of the rocker the movement of the push rod approaches zero. The pump plunger, of course, is operated through a cross head to which the push rod is connected. This system of full control gives very fine gradations of the amount of fuel which is injected and the arrangement used is even simpler than where a suction valve must be controlled in order to measure the amount of fuel to be injected.

The fuel supplied to the suction valves is under a pressure of 5 lb. per sq. in. This is obtained by having the gear pump which supplies the fuel to the auxiliary fuel reservoir on the engine operate against a spring loaded relief valve. In other words, when the fuel pressure builds up to the 5 lb. the excess fuel which is pumped by the gear pump overflows back to the main supply tank. By having the fuel under pressure the cylinders of the injection pumps are positively filled on the opening of the suction valve and there is no possibility of the pumps becoming air bound or of not discharging the full amount of fuel called for by the particular governor setting.

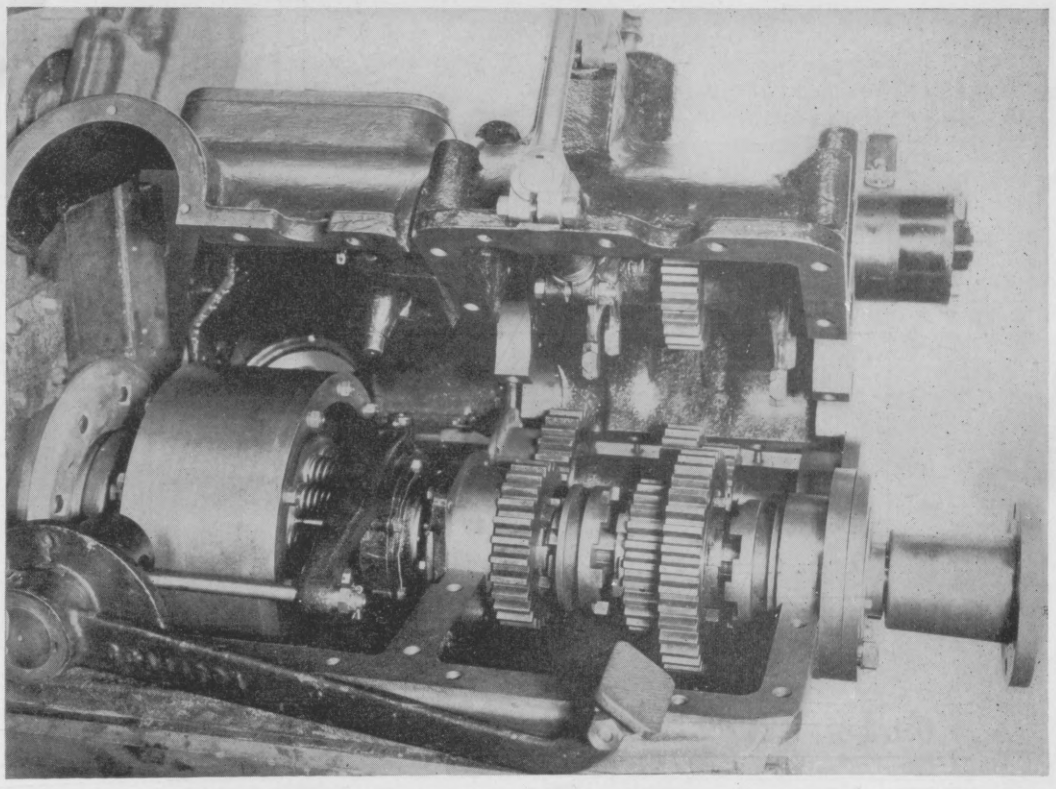
There is no starting control wheel for this engine since it is built non-reversing and all that is required is a quick opening air valve in the air line to the pipe which leads to the starting valves. The governor setting is changed by means of a small hand wheel.

It requires several turns of the governor wheel to effect any substantial change in the speed of the engine and so a manual control is provided. There is the small knob on the upper left hand side of the governor housing. This works directly on the governor control shaft and therefore changes the setting of the injection pump plunger stroke to control the engine speed below that for which the governor is set, without changing the setting of the governor springs.

For most marine maneuvering service it is probable that the manual control will be used exclusively. When, however, it is necessary to operate the engine for any length of time at reduced speeds it is advisable to set the speed by means of the governor control wheel. The manual control is also used for shutting the engine down and for any quick changes of speed where the load remains reasonably constant.

Another important feature is the use of a built-in automotive type transmission which gives two speeds forward and one in reverse. With the transmission set for half speed operation and the engine turning over at half speed, the propeller turns at one-fourth full speed. At such a speed as this it would be possible to operate a fishing boat all day for trolling and still have the engine operate economically. Full power and full speed of the engine is used for reversing which is also another feature of the design.

This transmission is built with the same refinements used in building the engine and all gears are case hardened and every part is built to the highest specifications. In other words, it is not just a transmission which is added on to the engine.



Details of transmission gear on new F. M. engine

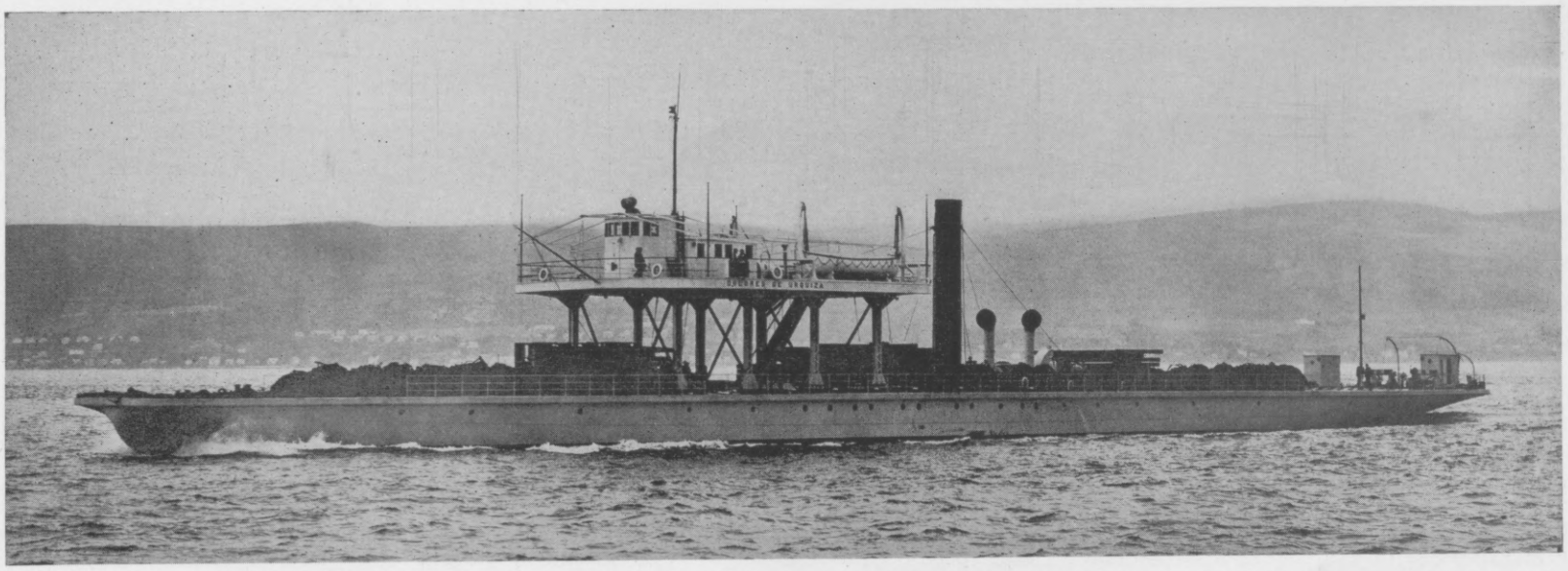
Big U. S. Motortanker Launched

GULFPRIDE, first vessel built in American yards on the new Isherwood bracketless system of hull construction and one of the largest motortankers in the world, was launched last month at the yard of the Federal Sb. and D. D. Co., Kearny, N. J., for the Gulf Refining Co. The deadweight capacity is 17,400 tons on a 28 ft. draft. The vessel is 544 ft. long over all, with a beam of 74 ft. and a molded depth of 40.5 ft. There are ten main cargo and ten summer tanks, having a total capacity for over 6,000,000 gal. of oil or gasoline.

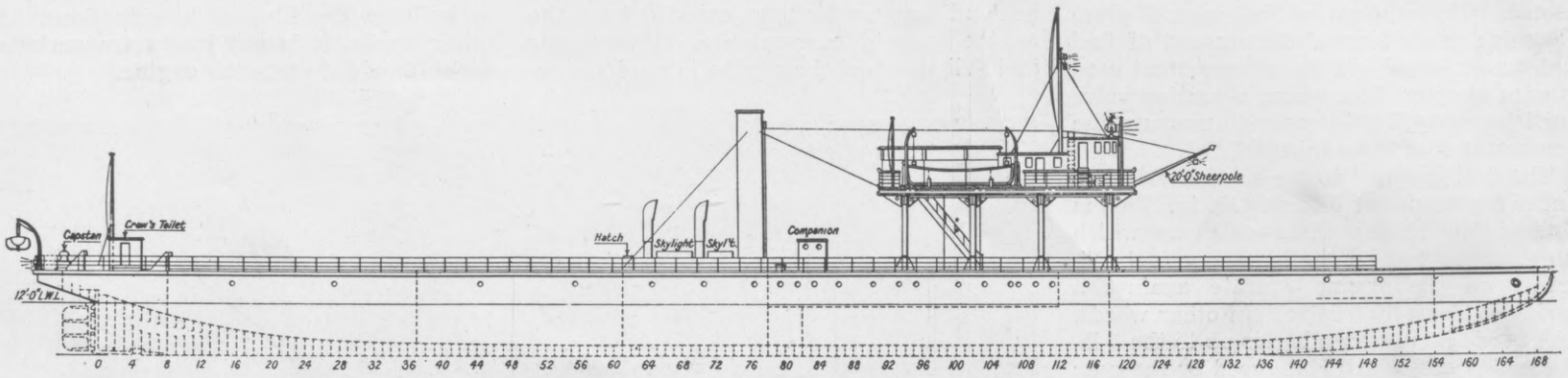
The ship's propelling machinery consists of two Bethlehem 4-cylinder, 2-cycle, single-acting Diesel engines of 2000 s.hp. each, giving the vessel a speed of 11 knots.

All auxiliary machinery, including the cargo oil pumps, will be electrically driven, and special mechanical ventilation is provided in the pump room as protection for gasoline cargo.

GULFPRIDE is expected to be ready for sea on about April 1, and her completion will mark an important event in American shipbuilding history.

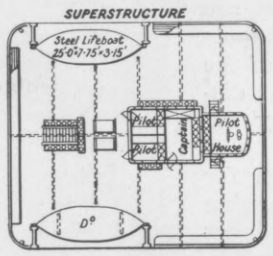


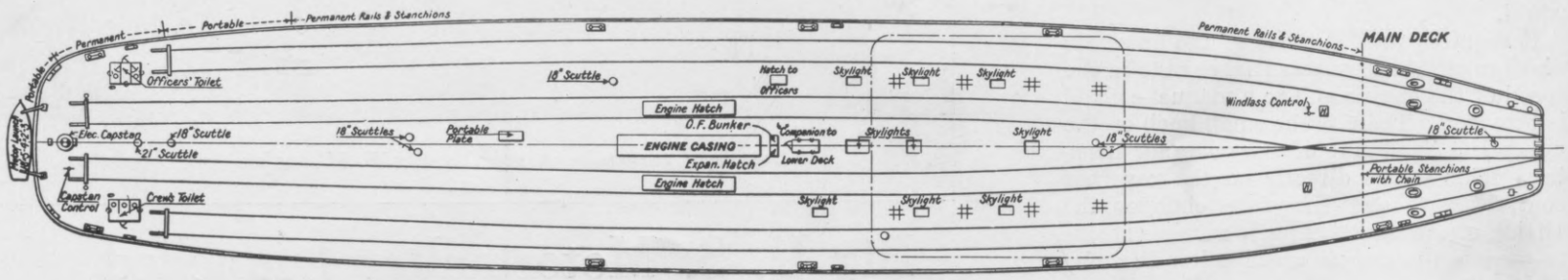
Ms. Dolores de Urquiza, a large self-propelled car float operating in South America, represents one of the latest conquests of the Diesel

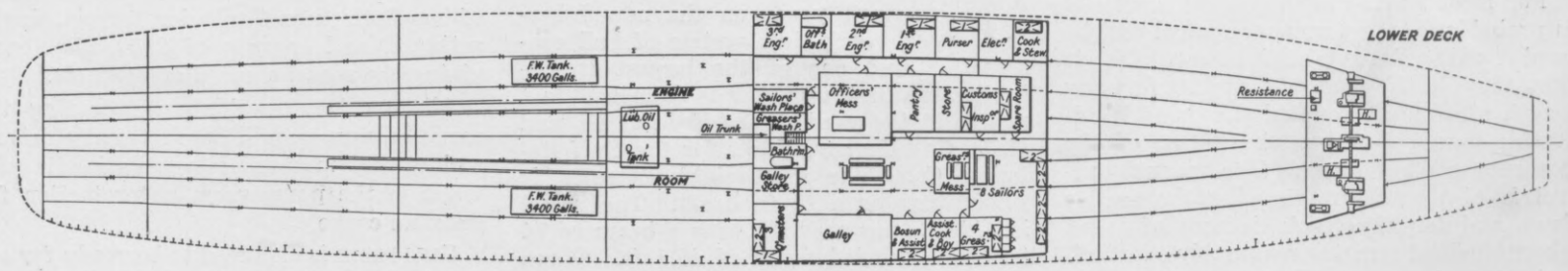


Characteristics of Car Ferry
Ms. Dolores de Urquiza

Length overall	355 ft. 6 in.
Beam, molded	57 ft. 6 in.
Depth, molded	19 ft. 10 in.
Gross tonnage	2217 tons







First Diesel Driven Rail Car Ferry

Novel Craft with 1800 hp. Diesels Is in Successful Operation on 50-Mile Run Across Parana River

M.S. DOLORES DE URQUIZA is the first ship of car-ferry type to be propelled by Diesel engines. She has been constructed to operate on the River Parana flowing between the Republics of Uruguay and Argentina, South America, and is designed especially to carry passenger and freight trains between two terminal points on this river about 50 miles apart.

With a length overall of 355.5 ft., a breadth molded of 57.5 ft. and a depth molded of 19.9 ft. she has a gross tonnage of 2217 tons and is powered by two 6-cylinder single-acting Harland & Wolff-B. & W. Diesels developing about 900 i.hp. at 200 r.p.m. The whole of the auxiliary machinery of the ship is electrically driven.

In dimensions, characteristics and duties Ms. DOLORES DE URQUIZA resembles very closely transfer ferries operating on Carquinez Straight, Cal., and on Lakes Michigan and Ontario. None of these ships operating in domestic waterways has yet taken advantage of the benefits of Diesel propulsion and it is a significant fact that this country, which probably knows more about the design of ships for railroad rolling stock transportation than any other country in the world, should thus be definitely lagging behind in a new development.

The new ship has a hull devoid of any sheer and with practically no camber. This hull is scow shape forward and has a more-or-less normal type of counter stern to enable it to take bossing and A-frames for twin screws. Internally the structure is very strongly stiffened by longitudinal truss girders and transverse bulkheads and in this way is very reminiscent of ordinary car float practise. In fact the ship actually is a large self propelling car float with pilot house and crew accommodations. The deck, which has four sets of rail tracks, is clear from end to end, with the exception of a low narrow engine casing upon which is a tall circular stack. A lattice structure forward of midships, as the general arrangement drawing shows, supports a deck upon which is mounted the pilot house and captain's cabin. This deck is also used to provide an airing space for passengers during the 4 hr. ride across the river. The hull is built of steel throughout and has been classed 100 A-1 with Lloyds.

In order to keep the forward end of the vessel, at which loading and unloading takes place, in alignment with the apron of the loading bridge there is a set of four forged steel sockets to receive the sliding pins of the aprons. Car buffers of heavy type are fitted at the after end of each pair of rails.

Accommodation for officers and crew are arranged below the main deck forward of engine room and these contain separate rooms for deck and engineer officers, petty officers and crew. There is also a large galley and pantry and officers' messroom and a crew's mess. In addition there are wash houses and bathrooms.

Under the main deck forward is a powerful electric windlass. This is arranged on a special platform built below the main deck. The chain cables are led up through pipes to the main deck and along to hawse pipes in which stockless anchors are stowed. Aft, there is a powerful reversing warping capstan driven by an electric motor of fully enclosed and watertight type, arranged on deck. The steering gear, of electric hydraulic type, works direct on to the rudder head and is placed below the main deck aft. Telemotor control is led to the wheelhouse and deck control is arranged aft.

Main propelling machinery consists of two sets of the latest type trunk piston H. & W.-B. & W. Diesels such as are now being fitted in numerous freighters of moderate size. These motors are lighter than the ordinary crosshead type and in this ship they are 6-cylinder units developing about 900 i.hp. each at 200 r.p.m. In design this type of engine differs from the crosshead type in several respects. The camshaft is at cylinder top level thus operating the valves direct instead of through the intermediary of pushrods. The valve levers are mounted on a pivoting shaft and in reversing this shaft is turned by operating the reverse lever, which brings a servo-motor into action. Turning motion causes the valve levers to be lifted off the cams and the camshaft then moves fore and aft at the influence of the servo-motor.

Reversing and starting controls are arranged on the after end of the engine. In this particular ship they have been centralized so that one engineer can control both engines from one position. A single 3-stage injection air compressor is driven off an extension of each crankshaft at the forward end. The camshaft is chain driven from the crankshaft. Fuel oil for the main engines is carried in two oil-tight bunkers fitted below the accommodation flat immediately in front of the engine room. These bunkers have a total capacity of 100 tons of fuel oil. A lubricating oil tank with an oil-tight center division is fitted below the engine room floor. It has a capacity of 5 tons. The main engines are fitted with supercharging blowers and this enables a 10 to 15 per cent increase in output to be obtained with a slightly increased normal service speed—11½ knots—if the ship, which operates to railroad time, is behind schedule.

Electricity for auxiliary purposes is supplied by two 55 kw. generators each driven by a 3-cylinder H. & W.-B. & W. Diesel. These engines are fitted with oversize air compressors so that in addition to supplying injection air for the engine the maneuvering air reservoir can be charged at the same time, thus dispensing with a separately driven air compressor. There is one steel reservoir for maneuvering air storage at 25 atmospheres.

With the exception of the bilge and fuel oil pumps which are driven off the main engines, all the auxiliary machinery units are driven by independent electric motors.

The vessel has a capacity of 33 cars each of 40 tons capacity. Engined by Harland & Wolff, Ltd., Glasgow, she was constructed by A. & J. Inglis, Glasgow, for the Entre Rios Railways Co. Ltd., who have already constructed several steam driven craft of similar type for these owners.

Dieselising a San Francisco Ferry

GOLDEN GATE FERRY COMPANY of San Francisco has had three Diesel electric ferries and two steamers in operation on the San Francisco to Sausalito run. The contemplated service to Berkeley and the increased traffic to Sausalito have recently prompted them to order three new Diesel-electric automobile ferries.

Inasmuch as the two steamers were called into service during the rush seasons, it was economical for the Golden Gate Ferry Company to purchase boiler fuel for all of their ferries. The addition of the three new ferries makes the Diesel type of propulsion predominant in number and therefore fosters the use of Diesel fuel. To operate the entire fleet at the best economy, it appeared profitable to convert the steamer GOLDEN CITY to Diesel propulsion. The change involved the problem of using the steam engine line shafting formerly driven by a high speed reciprocating engine from a destroyer and connecting it to the Diesel unit, a problem which was complicated by the small clarance between the ship's timbers and the shaft.

A 6-cylinder, 600 hp. Washington-Estep Diesel has been purchased for the conversion. This unit will be provided with a clutch on each end. Each clutch will engage its respective line shafting through gearing. One line shaft will be provided with a right-hand propeller and the other opposite line shaft will be provided with a left-hand propeller. In this way the aft wheel, idling when the ship is en route, will drive the ship in ahead direction and the forward wheel will be used for reversing during maneuvering periods, by engaging its respective clutch.

The main unit will, therefore, operate the vessel in one direction and the ship's movements will be accomplished by engaging the proper clutch.

A 110 hp. Diesel is used to power the buoy-tender COCO SOLO which has been built by the Mechanical Division of the Panama Canal and turned over to the Lighthouse Subdivision for use. She will be used for tending buoys in Canal waters and taking small parties through the Gaillard Cut during the season.

Personal

H. E. Brelsford, appointed Assistant Works Manager of the Buffalo plant of the Worthington Pump and Machinery Corporation on January 1, has had charge of all the engineering work and machinery purchasing concerned in the U. S. Shipping Board's Diesel Conversion Programme. Mr. Brelsford became associated with the Emergency Fleet Corporation in June, 1919, and from that date until January, 1921, he was in charge of turbine and gear inspection on all equipment made for the corporation. Later he took charge of the Technical Section of the Fleet Corporation and supervised the whole of the engineering work. Mr. Brelsford has had considerable and valuable experience as an engineer. Graduating from the University of Michigan in 1911 with the degree B.E.E., he entered the Test Department of the General Electric Co.'s Schenectady works, and after two years in this position he went to the Kerr Turbine Co., Wellsville, N. Y., to take charge of testing in the service department and also to take up the duties of

H. E. Brelsford, marine engineer

assistant chief engineer. Mr. Brelsford has worked ceaselessly and tirelessly for the success of the Diesel conversions and the results are a fine tribute to his ability as well as to that of his loyal staff of colleagues.

Allen D. Woods, Naval Architect for the Division of Maintenance and Repair of the Fleet Corporation, U. S. Shipping Board, who is responsible for all hull work, arrangement of quarters, main engine foundations and other structural work in connection with the conversion to motorships of the 12 vessels in the board's present program, received his technical education partly at Webb's Academy for Shipbuilders, New York, where he graduated with honors, later and partly at the University of Glasgow, Scotland, of which he is also a graduate. He obtained practical experience in Cramp's and other drafting officers for several years, after which he was in charge of new construction and repairs in the fleet of the Central Railroad of New Jersey, comprising over a hundred craft of all kinds such as light and heavy derricks, carfloats, tugs, ferryboats and the fast Sandy Hook Steamers. After 6 years in this position, he started in practice as Consulting Engineer and Naval Architect, maintaining this for 8 years. In September, 1918, went to the Hog Island Shipyard as Naval Architect for the Fleet Corporation. He held this position until the completion of the yard's work in 1920, when he was transferred to the New York office, under Captain R. D. Gatewood. Here he has been

Allen D. Woods, naval architect

associated with all work of reconditioning, alterations and extraordinary repairs to passenger and freight vessels of the Fleet Corporation. The very complete and comprehensive installation specifications for the Diesel conversion jobs, resulting in the work being accomplished in a highly efficient manner which has occasioned all round favorable comment, are largely the work of Mr. Woods.

George W. Codrington, vice-president and general manager of the Winton Engine Company, Cleveland, Ohio, returned recently from a 6-week business and pleasure trip to Europe. Mr. Codrington reports that he had an interesting trip and that he enjoyed especially the time spent at the plants of some of the European Diesel engine builders. At all of the various plants which he found time to visit, he was treated with the utmost courtesy and consideration. "The leaders in the Diesel engine industry abroad are certainly a progressive, high-grade group of men," says Mr. Codrington. "Coming into close contact with them, getting their viewpoint on various features of Diesel engine designing and building of interest and special significance was a rare privilege, and to partake of their cordial hospitality a never-to-be-forgotton pleasure." Mr. Codrington visited the following plants: Germania Werft, Kiel, Germany, where the Krupp Diesels are built; M. A. N. Diesel Plant at Augsburg, Germany; Sulzer Brothers, Ltd., whose plant is located at Winterthur, Switzerland; Krupp Steel Plant, at Essen, Germany. His itinerary included Hamburg, Berlin, London, Glasgow and Paris.

G. W. Codrington, V. P. Winton Engine Co.

J. T. Welsh, appointed Chief of the Technical Section, U. S. Shipping Board, effective January 1, is a graduate of the University of Wisconsin. He entered the employ of the Shipping Board in April, 1918, and has performed much useful work in connection with the Diesel conversions.

O. H. Wiese, who acted in an advisory capacity in the Shipping Board's Dieselization Programme, supervised the preparation of specifications and the purchase of all the Diesel engines for the programme. Mr. Wiese is a specialist in Diesel engine work and was at one time engaged on design work with the McIntosh & Seymour Corporation, Auburn, N. Y.

Thomas R. Allen has been appointed assistant works manager of American Brown Boveri Electric Corporation, effective January 7. Mr. Allen will direct all shipbuilding activities.

New Edition of Alaska Pilot

Colonel E. Lester Jones, director of the U. S. Coast and Geodetic Survey, announces publication of a new edition of Part II of the Alaska Coast Pilot. This volume, which covers the waters west of Yakutat Bay including Bering Sea and Arctic Ocean, has been brought up to date and contains the latest information derived from recent surveys along the Alaska Peninsula.

For the first time complete descriptions and sailing directions are given for large bodies of water such as Pavlof, Cold and Morzhovoi Bays, which were formerly passed over with the brief statement, "No information available."

As new editions of the Pacific Coast Pilot and Alaska Pilot, Part I, have been issued recently, the complete series for the Pacific Coast is now up to date and affords the mariner the latest information available to supplement his charts of this important region.

These pilots are sold at 75 cents each and may be obtained from the chart agencies of the Coast and Geodetic Survey in various ports or from the Washington office.

Catalogs

Winton Diesels.—Two booklets have just been issued by the Winton Engine Works. One of these books is devoted to illustrations and brief descriptions of a number of modern luxurious yachts, all of which are powered with Winton Diesels, and many of which have been completed during the last year.

The second book deals with commercial craft, such as tugs, fireboats, revenue cutters, river vessels, barges, dredges, stern wheelers, etc., and includes illustrations of the various Winton engines installed.

A limited number of copies of these books can be obtained by writing Mr. G. W. Codrington, vice-president, Winton Engine Company, Cleveland, Ohio.

A new booklet dealing with Cutless propeller shaft bearings has just been issued by B. F. Goodrich Rubber Co., of Akron, Ohio. Naval architects, boat builders and boat owners desiring a copy should write to L. Q. Moffitt, Manager, Cutless Bearing Division at the Akron office.